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COMPILATION OF STATE DATA FOR EIGHT SELECTED TOXIC SUBSTANCES

VOLUME IV. COMPILATION OF SUMMARIES AND ANALYSES OF STATE DATA

MITRE CORPORATION

PREPARED FOR
ENVIRONMENTAL PROTECTION AGENCY

SEPTEMBER 1975

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VOLUME IV
COMPILATION OF SUMMARIES AND ANALYSES OF STATE DATA

SEPTEMBER 1975
FINAL REPORT

PRICES SUBJECT TO CHANGE

U.S. Environmental Protection Agency
Office of Toxic Substances
Washington, D.C. 20460

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In June 1974, the Office of Toxic Substances, EPA, contracted with MITRE to collect and analyze toxic substances data in the U.S. In the next 14 months MITRE contacted agencies in 20 key states and collected and analyzed their monitoring data. This appendix contains all the summaries and analyses of state agency data that were presented in the four quarterly reports during the course of the project.

17. KEY WORDS AND DOCUMENT ANALYSIS

a. DESCRIPTORS		b. IDENTIFIERS/OPEN ENDED TERMS	c. COSATI Field/Group
Arsenic	Lead		
Beryllium	Mercury		
Cadmium	PLB's		
Chromium	Toxic Substances - Data Collection		
Cyanide			

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VOLUME IV

COMPILATION OF SUMMARIES AND ANALYSES OF STATE DATA

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SEPTEMBER 1975

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INTRODUCTION

The MITRE Corporation performed a study for the Office of Toxic Substance (OTS), Environmental Protection Agency, entitled Collection of Data and Data Analysis for Toxic Substances. The objectives of the study were to contact as many state agencies as resources allowed; acquire available toxic substances data; process and analyze the data; and report on the availability, nature and usefulness of the data, and the capabilities of the agencies for toxic substances monitoring.

During the course of the project, MITRE published four quarterly reports, each of which contained a section of summary and analysis of the state toxic substances data received during the quarter. Because the combined data summary and analysis sections from all four reports represent all the data that was summarized and analyzed during the project, the OTS project officer requested that those four sections be merged and published as a supporting volume to the final report. Consequently, MITRE compiled the data summary and analysis sections, and they are published here as Volume IV. The various volumes which comprise the final report are as follows:

- Volume I: Collection and Analysis of Toxic Substances Data from State Agencies - Final Report
- Volume II: Directory of State Toxic Substances Monitoring Agencies
- Volume III: State Data and Information Sources Used in

the Course of the Study - An Annotated Bibliography

- Volume IV: Compilation of the Summaries and Analyses of State Data
- Volume V: Monitoring Program Capability Descriptor Tables.

FIRST QUARTER

DATA SUMMARY AND ANALYSIS

ANALYSIS OF TEST STATES' DATA

Overview of Analysis

The toxic substances data analyzed in Phase 1 came from four media: air, water, animal tissue and soil. In Colorado, four agencies supplied data which was pertinent to the project. They are the Milk, Food and Drug Division of the Colorado Department of Health; Engineering and Sanitation Division of the Department of Health; Denver City/County Health Department; and the Division of Wildlife of the Department of Natural Resources. For Pennsylvania, there are five agencies that furnished relevant data. These are the Bureau of Food and Chemistry of the Department of Agriculture; Bureau of Air Quality of the Department of Environmental Resources; City of Philadelphia Air Management Services; Bureau of Air Pollution Control for Allegheny County; and the Allegheny County Health Department Lead Control Program.

The Colorado Department of Health furnished 854 values for lead found in the pottery utensils. There are 26 pages of drinking water data with reports on arsenic, cadmium, lead and cyanide from the Department of Health's Engineering and Sanitation Division. The Denver City/County Health Department produced 54 water quality values for three parameters, arsenic, cadmium and lead. There were eight pages of tissue data (fish tissues) on cadmium and lead from the Division of Wildlife of the Department of Natural Resources, with a total of about 216 values for each metal. In addition, there were 303 lead values from Canada geese tissues from the same agency.

There were 86 values of lead data from the Lead Control Program of Allegheny County. There were in excess of 50,000 values of air quality data from the Pennsylvania Bureau of Air Quality, Philadephia Air Management Services, and from the Allegheny County Air Quality Section. The Pennsylvania Bureau of Food and Chemistry produced 26 values for PCB's, mercury, lead and arsenic.

The information and data from Pennsylvania and Colorado reveal that there is a wide range of monitoring programs for toxic substances. Most of the monitoring done on a regular, systematic basis is conducted in water and air programs. Data in other media usually results from special, usually short-term projects. When such data is present, it is often in such a small amount that a meaningful statistical analysis is difficult or impossible.

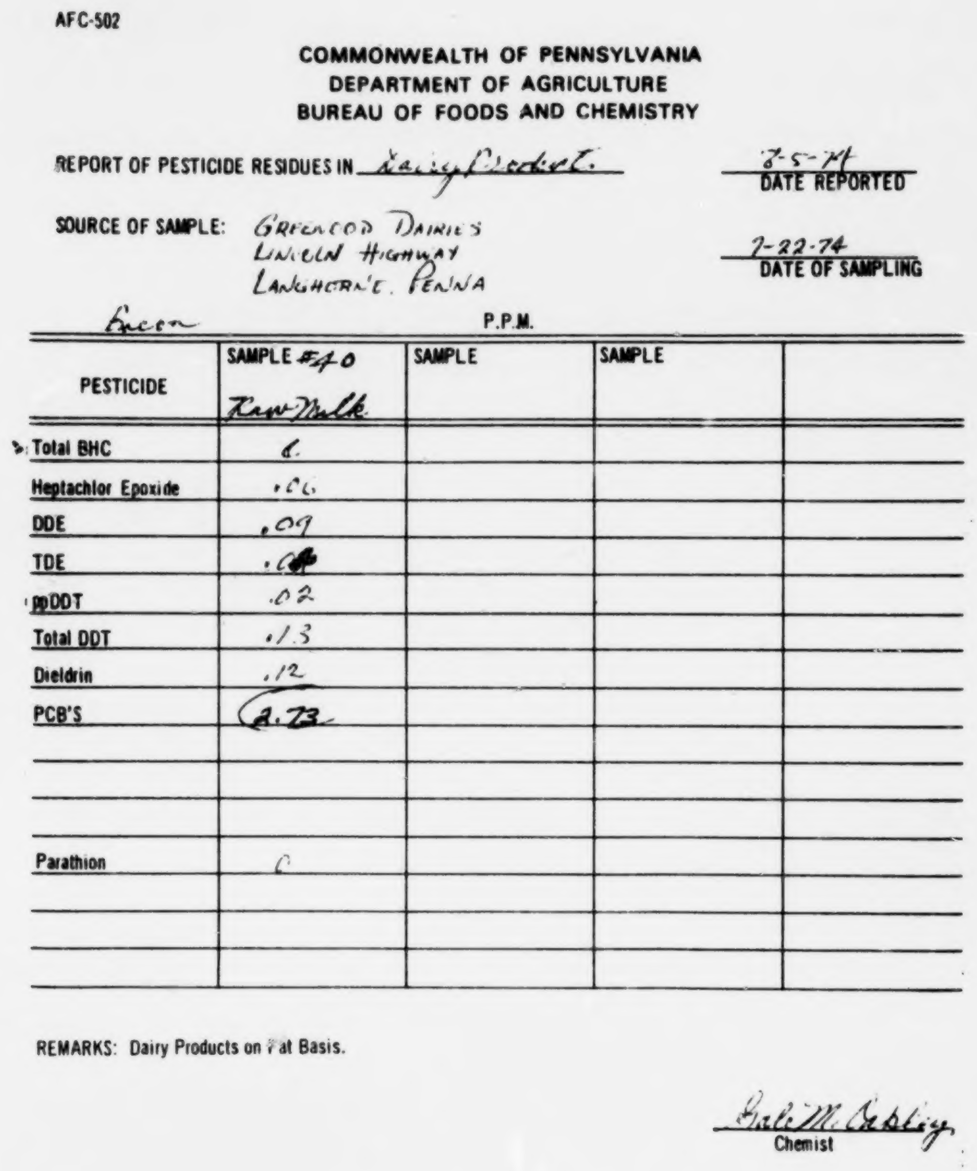
Because of the very wide variety in the data which was received from agencies in the two test states, there is clearly no single standard format which is appropriate for recording and analyzing all toxic substances data. At the least, a separate format is required for each medium in which the toxic substances are monitored. Since several storage and retrieval systems are already in operation on a nationwide scale for several of the media, and since these systems do include toxic substances data, it was decided that the data recording formats of these systems would be used for Phase 1 data handling and analysis. Consequently, the small amount of Colorado water quality data received which is not already in the STORET system has been recorded on STORET forms. The much larger volume of Pennsylvania air quality data not already in the National Aerometric Data Bank has been recorded in SAROAD format for storage and analysis. The other media in which data has been received - food, tissue, soil, and materials - do not generally have a widely accepted standard data format. For these, where possible, MITRE designed a simple standard format which could be easily adapted as similar data from other states is received. Once data from the agencies in the test states was transformed, summarization and analysis proceeded where appropriate. The following sections described the processing and analyses which were performed on each portion of data received.

Pennsylvania Department of Agriculture, Bureau of Foods and Chemistry

The Bureau of Foods and Chemistry is responsible for analyzing all foods and feeds in Pennsylvania when presence of foreign materials is suspected, and for generally routine sampling of milk and dairy products to detect presence of pesticides. The Bureau is capable of monitoring for any of the toxic substances of interest. Over the years, suspect samples have been analyzed for lead, mercury, and arsenic; additionally, PCB's have been detected in milk as a result of analysis for DDT. While over 9,000 samples a year are analyzed, only 14 reports since 1971 have concerned analysis for any of the toxic substances of interest.

Data records are maintained by the Bureau on one of two forms filed by regional and Agriculture Department agents. The first, an example of which is shown as Figure 1, is for the generally routine analysis for pesticides in dairy products. Because PCB's can often be detected when analysis is done for pesticides, a line for them is included on the Pennsylvania form. As Figure 1 shows, sample 675 contained 0.45 ppm of PCB's. The second form, shown in Figure 2, is a 5 x 8 card used to record results of any special analysis of suspect food or feeds. In the case of this example, suspect commercial rabbit food was analyzed and 1.42 ppm of lead was found.

Although the 14 reports covering four years are not a sufficient number for very useful analysis, the data, such as it is, has been extracted and recorded on a standardized tabular format. Table 1 shows all of the Bureau of Foods and Chemistry data for the period 1971---present. The data has been presented to show toxic substances analyzed,



AFC-502

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF AGRICULTURE
BUREAU OF FOODS AND CHEMISTRY

REPORT OF PESTICIDE RESIDUES IN Dairy Product.

8-5-74
DATE REPORTED

SOURCE OF SAMPLE: GREENWOOD DAIRIES
LINCOLN HIGHWAY
LANGHORNE, PENNA

7-22-74
DATE OF SAMPLING

Green

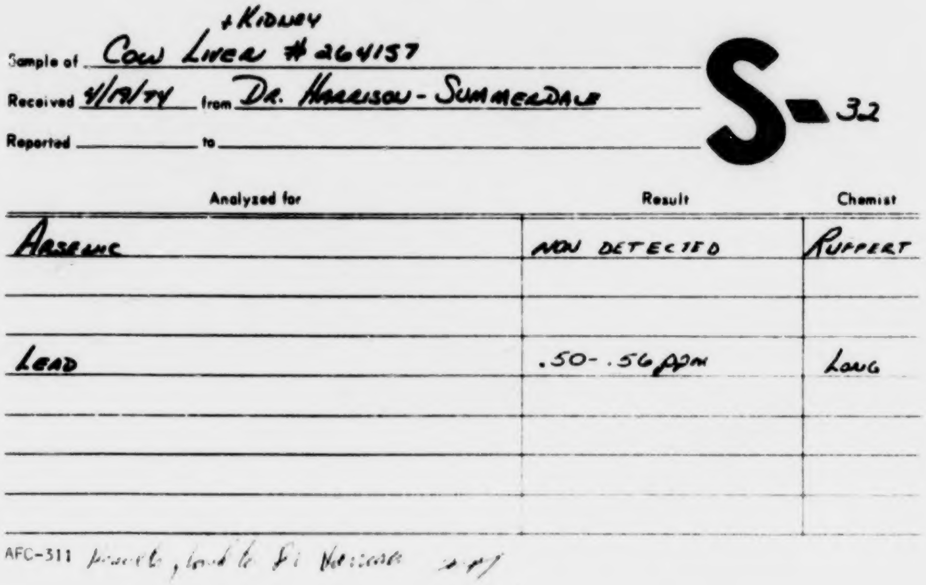
P.P.M.

PESTICIDE	SAMPLE #40 Raw Milk	SAMPLE	SAMPLE	
Total BHC	0.			
Heptachlor Epoxide	.06			
DDE	.09			
TDE	.0[illegible]			
ppDDT	.02			
Total DDT	.13			
Dieldrin	.12			
PCB'S	2.73			
Parathion	0			

REMARKS: Dairy Products on Fat Basis.

Gale M. Oebling
Chemist

FIGURE 1
PENNSYLVANIA FORM FOR RECORDING DATA FROM DAIRY PRODUCTS MONITORIN



Sample of Cow Liver + Kidney #264157

Received 4/19/74 from Dr. Harrison - Summerdale

Reported ______ to ______

S-32

Analyzed for	Result	Chemist
Arsenic	Non detected	Ruppert
Lead	.50-.56 ppm	Long

AFC-311 [illegible]

FIGURE 2
PENNSYLVANIA FORM FOR RECORDING DATA FROM SPECIAL ANALYSES

TABLE 1

PENNSYLVANIA BUREAU OF FOODS AND CHEMISTRY
TOXIC SUBSTANCES ANALYSIS RESULTS

REPORT I.D.	DATE SAMPLED	TOXIC SUBSTANCE	SAMPLE MATERIAL	SAMPLE ORIGIN	DATA VALUE	UNIT	ANALYSIS METHOD
S-46	12/17/71	PCB's	Trout Food	Agent Woods	0.23	PPM	FDA Survery
S-46	12/17/71	Hg	Trout Food	Agent Woods	0.3	PPM	Atomic Absorption
S-24	12/20/72	Hg	Feed Corn	Game Commission	-0-		Atomic Absorption
675	5/9/73	PCB's	Raw Milk	Stump Acres Dairy, York	0.46	PPM	FDA Survey
709	6/12/73	PCB's	Pasteurized Milk	Wallace Dairy, New Castle	6.63	PPM	FDA Survey
305	11/29/73	PCB's	Raw Milk	Johnston's Dairy Monroeville	3.88	PPM	FDA Survey
S-22	3/21/74	Pb	Dog Meal	Unknown	0.88	%	Atomic Absorption
S-27	4/2/74	Pb	Dog Pellets	Altoona	1.38	%	Atomic Absorption
S-32	4/19/74	As	Cow Liver	Summervale	-0-		Atomic Absorption
S-32	4/19/74	As	Cow Kidney	Summervale	-0-		Atomic Absorption
S-32	4/19/74	Pb	Cow Kidney	Summervale	0.56	PPM	Atomic Absorption
S-32	4/19/74	Pb	Cow Liver	Summervale	0.56	PPM	Atomic Absorption
S-43	5/22/74	Pb	Rabbit Pellets	Rene Averia	1.42	PPM	Atomic Absorption

TABLE 1(Continued)

REPORT I.D.	DATE SAMPLED	TOXIC SUBSTANCE	SAMPLE MATERIAL	SAMPLE ORIGIN	DATA VALUE	UNIT	ANALYSIS METHOD
S-42	5/22/74	Pb	Rabbit Pellets	O'Brian Milling	0.74	PPM	Atomic Absorption
S-15	7/12/74	As	Cow Liver	Weaver, R.D.4, Carlisle	2.7	%	Atomic Absorption
S-15	7/12/74	As	Cow Kidney	Weaver, R.D.4, Carlisle	5.0	%	Atomic Absorption
S-15	7/12/74	As	Cow Absomal Content	Weaver, R.D.4, Carlisle	3.6	%	Atomic Absorption
S-15	7/12/74	As	Cow Reticulum Content	Weaver, R.D.4, Carlisle	12.9	%	Atomic Absorption
S-16	7/12/74	As	Cow Liver	Weaver, R.D.4, Carlisle	2.0	%	Atomic Absorption
S-16	7/12/74	As	Cow Kidney	Weaver, R.D.4, Carlisle	5.0	%	Atomic Absorption
S-16	7/12/74	As	Cow Absomal Content	Weaver, R.D.4, Carlisle	3.6	%	Atomic Absorption
S-16	7/12/74	As	Cow Reticulum Content	Weaver, R.D.4, Carlisle	12.9	%	Atomic Absorption
S-17	7/12/74	As	Plants (Unspecified)	Weaver, R.D.4, Carlisle	159.7	PPM	Atomic Absorption
40	7/22/74	PCB's	Raw Milk	Greenwood Dairies Langhorne	2.73	PPM	Atomic Absorption
46	7/28/74	PCB's	Raw Milk	Ramsev Dairy Butler	5.32	PPM	Atomic Absorption
S-29	8/2/74	Pb	Calf Liver	Dr. Clark, Summerdale	7.34	PPM	Atomic Absorption
S-29	8/2/74	Pb	Calf Kidney	Dr. Clark, Summerdale	8.96	PPM	Atomic Absorption

value (as either a percent of material analyzed or as parts per million), date of sampling, location of sampling (where available), material that was analyzed, and method of analysis.

Table 2 summarizes the analyses of the data from the 14 Bureau of Foods and Chemistry reports. Perhaps the most significant result shown by the summary is the very small amount of toxic substances data which is available from the state agency concerned with foods and feeds. While there does appear to be a considerable increase in the number of samples analyzed thus far in 1974, Dr. Thornton, head of the Foods and Chemistry Laboratory, cautioned that this should not necessarily be regarded as a trend. As the footnote in Table 2 indicates, more than half the samples analyzed in 1974 were the various organs and stomach contents of two cows which died in two incidents involving the improper application of a herbicide containing arsenic. Given the present low level of effort of toxic substances monitoring, the small amount of data available from the Bureau of Foods and Chemistry cannot be considered particularly useful in assessing levels of toxic substances in the environment in Pennsylvania.

TABLE 2

SUMMARY OF THE PENNSYLVANIA BUREAU OF FOODS AND CHEMISTRY TOXIC SUBSTANCES DATA (UNITS IN PPM)

Toxic Substance	No. of Samples	Min.	Max.	Mean
1971				
Arsenic	-0-	---	---	---
Beryllium	-0-	---	---	---
Cadmium	-0-	---	---	---
Cyanide	-0-	---	---	---
Lead	-0-	---	---	---
Mercury	1	0.30	0.30	0.30
PCB's	1	0.23	0.23	0.23
1972				
Arsenic	-0-	---	---	---
Beryllium	-0-	---	---	---
Cadmium	-0-	---	---	---
Cyanide	-0-	---	---	---
Lead	-0-	---	---	---
Mercury	1	-0-	-0-	-0-
PCB's	-0-	---	---	---
1973				
Arsenic	-0-	---	---	---
Beryllium	-0-	---	---	---
Cadmium	-0-	---	---	---
Cyanide	-0-	---	---	---
Lead	-0-	---	---	---
Mercury	-0-	---	---	---
PCB's	3	0.46	6.63	3.66
1974				
Arsenic	11*	-0-	159.70	79.85
Beryllium	---	---	---	---
Cadmium	---	---	---	---
Cyanide	---	---	---	---
Lead	8	0.56	8.96	3.03
Mercury	---	---	---	---
PCB's	2	2.73	5.32	4.025

*All of the 11 reported samples were collected as a result of two incidents of herbicide poisoning.

Pennsylvania Bureau of Air Quality

The Pennsylvania Bureau of Air Quality is responsible for the task of monitoring ambient air quality throughout the state of Pennsylvania. One prime directive is to ensure Pennsylvania's compliance with Federal and State regulations governing total suspended particulate. Additionally, a variety of specific constituents found within the particulate matter are analyzed by the Bureau for their own interests.

The Bureau supplied MITRE with a generous amount of ambient air quality data, although not all of these seven toxic substances that are of major concern to the OTS were contained in this data. For the eleven air basins analyzed, four toxic substances of the major seven sought by OTS were prevalent in the 1971 - 1973 data:

- Arsenic
- Beryllium
- Cadmium
- Lead

The remaining three substances of interest, cyanide, mercury, and polychlorinated biphenyls, were not analyzed for by the Bureau. The toxic substances which are analyzed by individual basin appear in Table 3 . Pennsylvania conducts its ambient air sampling procedures at a total of 94 sampling sites dispersed throughout eleven air basins statewide. This sampling is generally conducted at the test sites on a schedule of approximately one 24-hour sample

TABLE 3

TOXIC SUBSTANCES ANALYSIS SUMMARY*

BASIN	1971				1972				1973			
	As	Be	Cd	Pb	As	Be	Cd	Pb	As	Be	Cd	Pb
ALLENTOWN					X	X	X	X				X
BEAVER VALLEY		X	X	X	X	X	X	X				X
ERIE		X	X	X	X		X					X
HARRISBURG		X	X	X	X		X					X
JOHNSTOWN					X	X	X	X				X
LANCASTER		X	X	X	X		X					X
MONONGAHELA VALLEY		X	X	X	X	X	X	X				X
READING		X	X	X	X	X	X	X				X
SCRANTON WILKES-BARRE		X	X	X	X		X					X
SOUTHEAST PENNSYLVANIA					X	X	X	X				X
YORK		X	X	X	X	X	X	X				X

---

* Each X represents a set of approximately 65 data points for each of twelve months for a total of 780 data points.

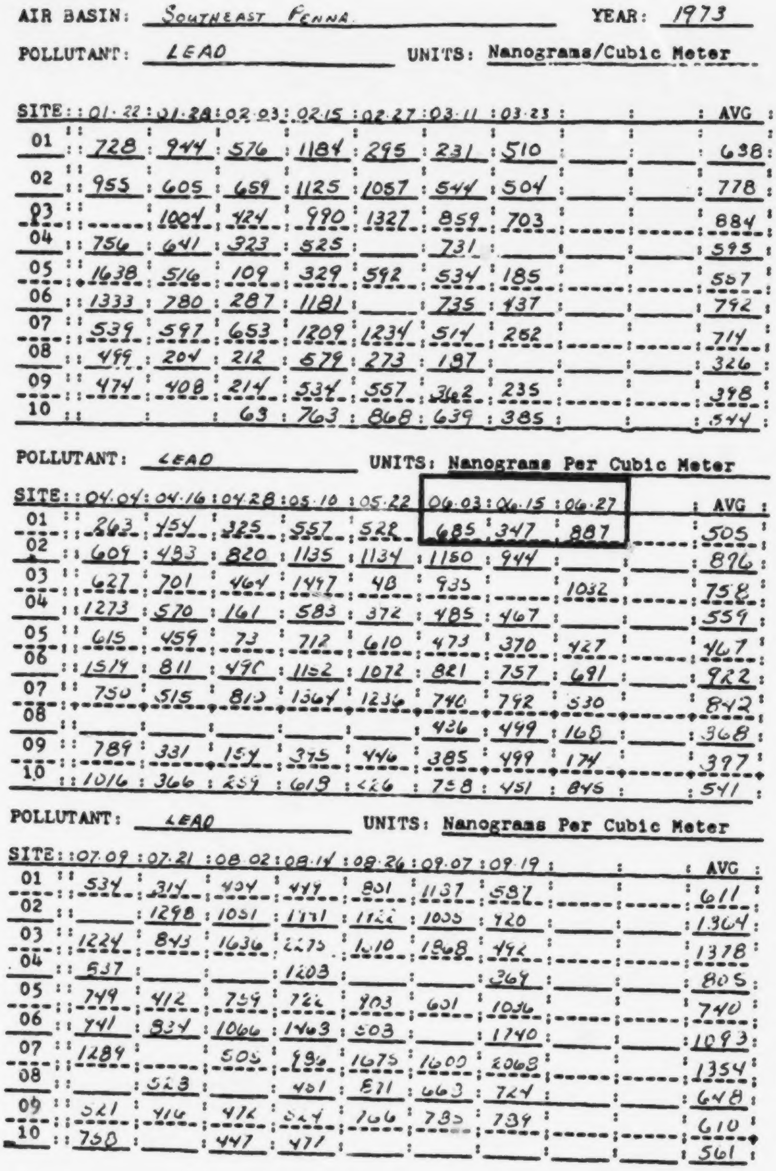
every six days. Following sample analysis, total suspended particulate data is forwarded to EPA for entry into the SAROAD system for utilization on a nationwide scale.

Referring again to Table 3, the total amount of data supplied by the Bureau was estimated to be approximately 50,000 data points. Each X on the table identifies a set of constituent data (given in terms of month, year, and site), and actually represents approximately 12 months data, each month comprising an estimated 65 data points.

Data Analysis

An example of the raw data received by MITRE from the Pennsylvania Bureau of Air Quality is illustrated in Figure 3. This particular example depicts the varying degree of lead concentrations in Southeast Pennsylvania (Philadelphia Metropolitan Area) during the time span January through September, 1973 for Southeast Pennsylvania test sites 1 through 10. Figure 3 lists 193 individual data points which are coded on "SAROAD daily data forms", one of which appears as Figure 4. Figure 4 represents the transferred lead data for the 3rd, 15th, and 27th days of June, 1973. This data was transferred from the area highlighted by the black rectangle in Figure 3.

The daily data form (Figure 4) is a month's record of up to four different parameters observed at a common site over periods of 24 hours or longer. It is useful for 24-hour high volume air sampler data that are observed daily, every third day, every sixth day, or any other random schedule. One form can be used for up to four parameters as long



AIR BASIN: Southeast Penna. YEAR: 1973

POLLUTANT: LEAD UNITS: Nanograms/Cubic Meter

SITE	01·22	01·28	02·03	02·15	02·27	03·11	03·23			AVG
01	728	944	576	1184	295	231	510			638
02	955	605	659	1125	1057	544	504			778
03		1004	424	990	1327	859	703			884
04	756	641	323	525		731				595
05	1638	516	109	329	592	534	185			507
06	1333	780	287	1181		735	437			792
07	539	597	653	1209	1234	514	252			714
08	499	204	212	579	273	197				326
09	474	408	214	534	557	362	235			398
10			63	763	868	639	385			544

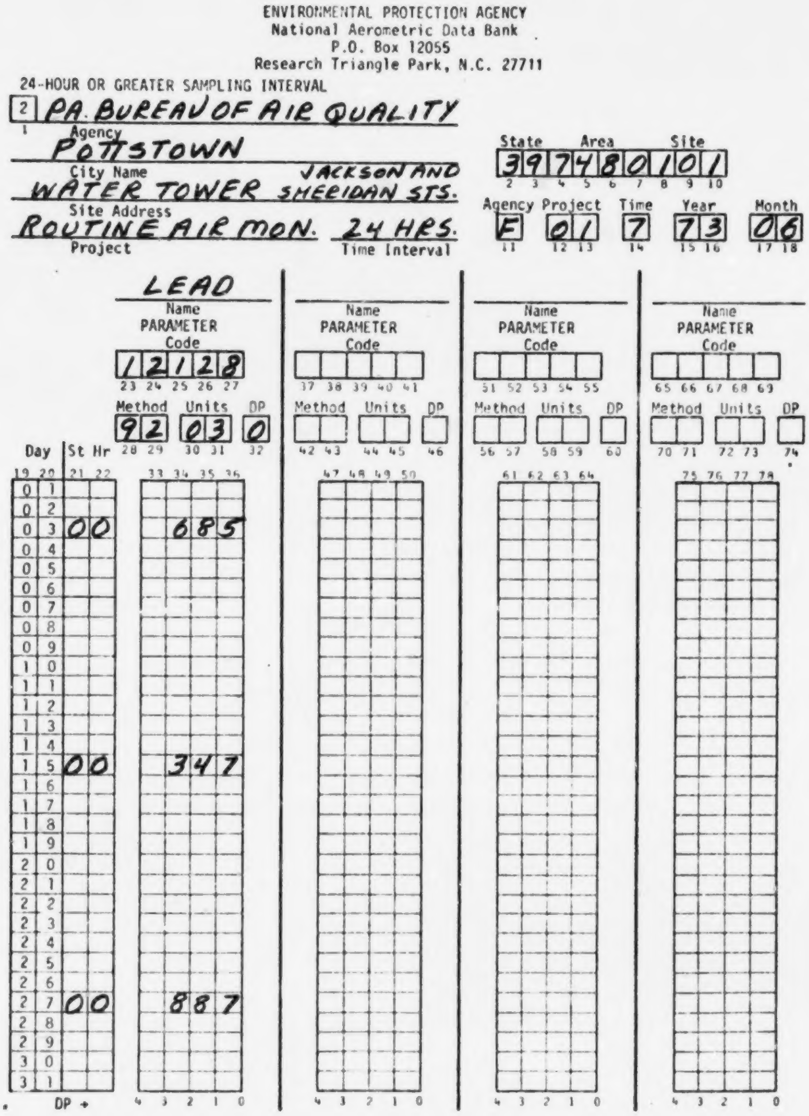
POLLUTANT: LEAD UNITS: Nanograms Per Cubic Meter

SITE	04·04	04·16	04·28	05·10	05·22	06·03	06·15	06·27		AVG
01	263	454	325	557	528	685	347	887		505
02	609	483	820	1135	1134	1150	944			896
03	627	701	464	1447	48	935		1032		758
04	1273	570	161	583	372	485	467			559
05	615	459	73	712	610	473	370	427		467
06	1519	811	490	1152	1072	821	757	691		922
07	750	515	813	1364	1236	740	792	530		842
08						436	499	168		368
09	789	331	154	375	446	385	499	174		397
10	1016	366	259	619	226	758	451	845		541

POLLUTANT: LEAD UNITS: Nanograms Per Cubic Meter

SITE	07·09	07·21	08·02	08·14	08·26	09·07	09·19			AVG
01	534	314	404	449	801	1137	587			611
02		1298	1051	1171	1122	1035	920			1364
03	1224	843	1636	2275	1610	1868	492			1378
04	537			1203			369			805
05	749	412	759	722	903	601	1036			740
06	741	834	1066	1463	503		1740			1093
07	1289		505	896	1675	1600	2068			1354
08		523		401	871	663	724			648
09	521	416	472	524	766	785	739			610
10	750		447	471						561

FIGURE 3
DATA RECEIVED FROM PENNSYLVANIA BUREAU OF AIR QUALITY



ENVIRONMENTAL PROTECTION AGENCY
National Aerometric Data Bank
P.O. Box 12055
Research Triangle Park, N.C. 27711

24-HOUR OR GREATER SAMPLING INTERVAL

2 (1) PA. BUREAU OF AIR QUALITY
Agency

POTTSTOWN
City Name

WATER TOWER JACKSON AND SHERIDAN STS.
Site Address

ROUTINE AIR MON. 24 HRS.
Project / Time Interval

State / Area / Site (2–10): 3 9 7 4 8 0 1 0 1

Agency (11): F
Project (12 13): 0 1
Time (14): 7
Year (15 16): 7 3
Month (17 18): 0 6

	Parameter 1 (23–36)	Parameter 2 (37–50)	Parameter 3 (51–64)	Parameter 4 (65–78)
Name	LEAD			
PARAMETER Code	1 2 1 2 8			
Method	9 2			
Units	0 3			
DP	0			

Day (19 20)	St Hr (21 22)	33 34 35 36	47 48 49 50	61 62 63 64	75 76 77 78
01					
02					
03	00	685			
04					
05					
06					
07					
08					
09					
10					
11					
12					
13					
14					
15	00	347			
16					
17					
18					
19					
20					
21					
22					
23					
24					
25					
26					
27	00	887			
28					
29					
30					
31					
DP →		4 3 2 1 0	4 3 2 1 0	4 3 2 1 0	4 3 2 1 0

FIGURE 4
SAROAD DAILY DATA FORM

as the site, time interval, and starting hour are the same. This daily data form was used to code all the data received from the Bureau because of its flexibility and ease of use.

As mentioned earlier, a voluminous amount of data was received from the Bureau (50,000 data points). This data is considered physically impossible to present in this document due to size limitations, although it is available at MITRE if more detailed information is desired. The data in analyzed form appears in Appendix A.

Allegheny County Air Quality Data

Dr. Arvid Ek of the Air Quality Section stated that Allegheny County, like Philadelphia, operates an air monitoring system separate from the state's and does perform high-volume filter analysis for some of the toxic substances of interest. Dr. Ek was certain there was data on lead and cadmium, and probably on four or five other metals not on the OTS list. He asked that MITRE call him after several days so he would have time to compile his data, and also to find out if there were other agencies in Allegheny County with toxic substances data.

When Dr. Ek was contacted again, he said he had data from air samples since 1971, and he provided names of other data contacts in Allegheny County. Although the substances analyzed from air sampler filters would vary somewhat from year to year, they included lead, cadmium, zinc, manganese, and nickel. Other air quality data is sent routinely to the SAROAD system, but the trace metal data has not been since it is not required by EPA. The trace metal data is on the

County's computerized air quality data system, and Dr. Ek said that he would obtain a printout of data from 1971 to the present. The computer printout was provided, and in addition Dr. Ek supplied complete information on sampling sites and methods of laboratory analysis for the trace metals of interest. The site description included such information as geographical location, street address where appropriate, physical surroundings, height of sampler above ground level, etc. The method description included the type of sampling device, the type of filter used, the sample preparation procedures in the laboratory, and a complete description of the actual method of analysis which was employed for each metal.

The data received from Dr. Ek was in computer printout format. Included was data from nineteen sites for the three-year period 1971 through 1973. Data for each site was reported on separate computer printouts for each year. Totalled at the bottom of each sheet were the maximum minimum, average and standard deviation values for that particular site.

After the data was received, it was recorded on the SAROAD daily data form, and then keypunched into machine-readable format. The data in this form could then be included in the national SAROAD system if desired.

The data was reported in micrograms per cubic meter with values for lead shown to three decimal places and values for cadmium shown to four decimal places. Ranges for lead were .000 to .428 micrograms per cubic meter, with cadmium ranging from .000 to .0829 micrograms per cubic meter.

Table 4 shows the summary of lead and cadmium values for all Allegheny County sites. The analyzed data in printout form appears in Appendix A.

TABLE 4

ALLEGHENY COUNTY HEALTH DEPT.
BUREAU OF AIR POLLUTION CONTROL
HI VOL. SAMPLING
(Micrograms per cubic meter)

TOXIC SUBSTANCE	NO. OF SAMPLES	MIN.	MAX.	MEAN
1971				
CADMIUM	343	.0000	.0188	.0018
LEAD	343	.000	.249	.024
1972				
CADMIUM	154	.0000	.0112	.0017
LEAD	154	.000	.319	.062
1973				
CADMIUM	264	.0000	.0829	.0006
LEAD	264	.000	.428	.073

City of Philadelphia Air Management Services

The City of Philadelphia's Air Management Services operates an air monitoring network that is separate from the state's own monitoring system. Philadelphia's Air Management Services is, among other things, responsible for analyzing its high volume air sampler filters for trace metal data.

In recent years, the routine monitoring program in Philadelphia has been for lead, iron, manganese, copper, nitrate, cadmium, magnesium, and aluminum. Of these eight trace metals, only lead and cadmium are presently on the list of toxic substances of interest to OTS. Philadelphia's data is obtained by performing one test daily at each of the three test sites in the city, with records kept on the basis of monthly averages for each site. MITRE was supplied with monthly averages of the eight aforementioned trace elements for 1972, 1973, and the first five months of 1974.

An example of the data supplied by Philadelphia's Air Management Services appears as Figure 5. This example displays the 1973 monthly averages for lead, iron, manganese, copper, nitrate, cadmium, magnesium, and aluminum. The standard SAROAD form that was used to code these data is shown as Figure 6. This is the SAROAD "multiple station form", which was developed for recording data at a sampling interval of 24 hours or greater for one parameter for up to 12 sampling sites. Figure 7 illustrates how the data for lead in January of 1973 for all three Philadelphia sites were transferred from raw data form (Figure 5) to

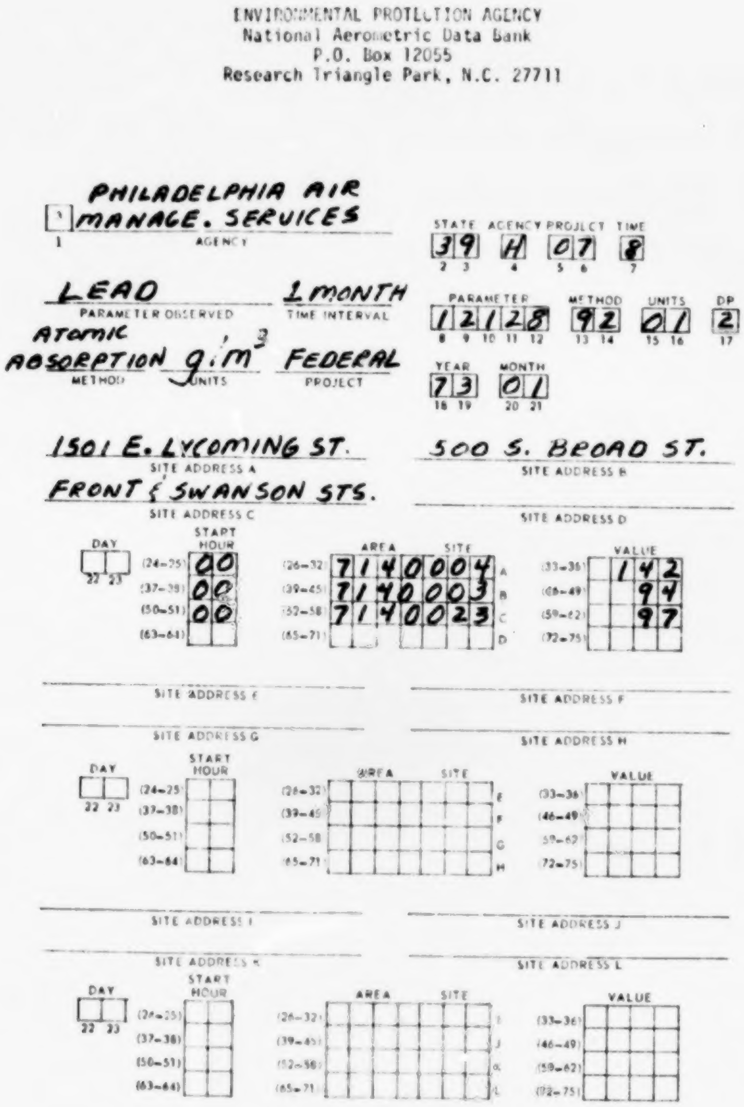
HVAS TRACE METAL DATA

in g/M^3 Air

1973

	Pb	Fe	Mn	Cu	Ni	Cd	Mg	Al
			1501 E. Lycoming Street					
Jan.	1.42	1.61	.078	.063	.047			
Feb.	1.52	2.18	.109	.071	.039	.0077	0.72	1.69
March	1.30	2.11	.122	.092	.044	.0055	0.86	1.19
Apr.	1.12	1.95	.072	.073	.036	.0045	0.69	1.32
May	1.32	1.57	.057	.077	.030	.0054	0.48	1.18
June	1.25	2.36	.065	.095	.030	.0054	0.57	1.23
July	1.27	1.91	.086	.065	.037	.0064	0.47	1.34
Aug.	1.42	2.18	.071	.113	.032	.0073	0.53	1.74
Sept.	1.42	1.62	.070	.175	.037	.0077	0.76	1.46
Oct.	2.05	1.86	.079	.190	.047	.0059	0.50	1.20
Nov.	1.84	1.53	.057	.126	.055	.0066	0.48	0.96
Dec.	1.70	1.26	.045	.135	.060	.0066	0.48	0.80
			500 S. Broad St.					
Jan.	0.94	1.40	.049	.043	.048	.0057		
Feb.	1.07	1.59	.056	.054	.038	.0081		
March	1.26	1.67	.084	.107	.052	.0069	0.75	1.29
Apr.	0.80	1.14	.030	.047	.031	.0040	0.52	1.18
May	1.16	1.96	.049	.069	.033	.0057	0.61	1.24
June	1.07	1.97	.041	.053	.031	.0041	0.55	1.34
July	0.95	1.75	.132	.056	.034	.0067	0.55	1.59
Aug.	0.93	1.51	.059	.095	.033	.0059	0.43	1.65
Sept.	1.01	1.37	.050	.092	.028	.0064	0.54	1.60
Oct.	1.16	1.29	.046	.112	.027	.0036	0.60	0.84
Nov.	1.40	1.44	.047	.128	.050	.0054	0.64	1.18
Dec.	1.04	1.02	.029	.120	.048	.0047	0.40	0.92
			Front & Swanson					
Jan.	0.97	2.42	.054	.056	.038		1.13	1.19
Feb.	1.04	2.75	.064	.100	.035		1.02	1.56
March	0.86	1.73	.071	.086	.028	.0041	0.65	1.00
April	0.68	1.74	.057	.068	.026	.0056	0.55	1.00
May	0.82	2.75	.080	.102	.021	.0042	0.37	1.08
June	0.61	1.77	.046	.096	.018	.0034	0.53	1.42
July	0.52	2.08	.061	.110	.037	.0037	0.54	1.32
Aug.	0.92	2.76	.065	.447	.025	.0055	0.80	1.76
Sept.	0.91	1.82	.079	.366	.028	.0055	0.65	1.37
Oct.	0.97	1.67	.065	.275	.026	.0042	0.53	0.97
Nov.	0.99	1.08	.032	.187	.034	.0047	0.48	0.97
Dec.	0.96	0.97	.040	.119	.044	.0057	0.33	1.11

FIGURE 5
AIR QUALITY DATA RECEIVED FROM PHILADELPHIA'S AIR MANAGEMENT SERVICES



ENVIRONMENTAL PROTECTION AGENCY
National Aerometric Data Bank
P.O. Box 12055
Research Triangle Park, N.C. 27711

1 PHILADELPHIA AIR MANAGE. SERVICES — AGENCY

STATE 39 (2 3) AGENCY H (4) PROJECT 07 (5 6) TIME 8 (7)

LEAD — PARAMETER OBSERVED

1 MONTH — TIME INTERVAL

PARAMETER 12128 (8 9 10 11 12) METHOD 92 (13 14) UNITS 01 (15 16) DP 2 (17)

ATOMIC ABSORPTION — METHOD

$\mu g/m^3$ — UNITS

FEDERAL — PROJECT

YEAR 73 (18 19) MONTH 01 (20 21)

1501 E. LYCOMING ST. — SITE ADDRESS A

500 S. BROAD ST. — SITE ADDRESS B

FRONT & SWANSON STS. — SITE ADDRESS C

SITE ADDRESS D

DAY (22 23)

	START HOUR		AREA	SITE			VALUE
(24–25)	00	(26–32)	714	0004	A	(33–36)	142
(37–38)	00	(39–45)	714	0003	B	(46–49)	94
(50–51)	00	(52–58)	714	0023	C	(59–62)	97
(63–64)		(65–71)			D	(72–75)	

SITE ADDRESS E

SITE ADDRESS F

SITE ADDRESS G

SITE ADDRESS H

DAY (22 23)

	START HOUR		AREA	SITE			VALUE
(24–25)		(26–32)			E	(33–36)	
(37–38)		(39–45)			F	(46–49)	
(50–51)		(52–58)			G	(59–62)	
(63–64)		(65–71)			H	(72–75)	

SITE ADDRESS I

SITE ADDRESS J

SITE ADDRESS K

SITE ADDRESS L

DAY (22 23)

	START HOUR		AREA	SITE			VALUE
(24–25)		(26–32)			I	(33–36)	
(37–38)		(39–45)			J	(46–49)	
(50–51)		(52–58)			K	(59–62)	
(63–64)		(65–71)			L	(72–75)	

FIGURE 6
SAROAD MULTIPLE-STATION DATA FORM

standardized SAROAD form for entry into the National Aerometric Data Bank. The Philadelphia data sheets in final coded form are too numerous to present in this report, although this data is available at EPA if more detailed data is desired.

A summary of the manual analysis of the Philadelphia data is shown on Table 5. As can be seen from the table, the mean values for lead and cadmium for 1972 through 1974 for all three test sites have decreased considerably. The range of decrease for lead was 13-30 percent, while for cadmium it was 25-37.5 percent.

TABLE 5

PHILADELPHIA DATA ANALYSIS SUMMARY

LEAD($\mu g/m^3$)

	1972				1973				1974			
SITE	MAX	MIN	MEAN	STD. DEV.	MAX	MIN	MEAN	STD. DEV.	MAX	MIN	MEAN	STD. DEV.
1501 East Lycoming St.	2.10	1.18	1.55	.306	2.05	1.12	1.47	.2642	2.00	1.11	1.35	.3682
500 South Broad St.	1.58	.93	1.25	.202	1.40	.80	1.06	.1622	1.46	.76	.94	.2943
Front and Swanson Sts.	1.93	.83	1.21	.402	1.04	.61	.86	.149	1.11	.72	.85	.154

CADMIUM($\mu g/m^3$)

	1972				1973				1974			
SITE	MAX	MIN	MEAN	STD. DEV.	MAX	MIN	MEAN	STD. DEV.	MAX	MIN	MEAN	STD. DEV.
1501 East Lycoming St.	–	–	–	–	.0077	.0045	.0069	.00123	.0064	.0033	.0051	.00136
500 South Broad St.	–	–	–	–	.0081	.0036	.0056	.001334	.0044	.0029	.0035	.000629
Front and Swanson Sts.	.0083	.0063	.0071	.00104	.0057	.0034	.0047	.00086	.0106	.0022	.0053	.00316

Allegheny County Lead Control Program

The Allegheny County Health Department, in an effort to determine the incidence of lead poisoning among children, set up a program of mass screening of children. It was hoped that this program would enable the determination of the extent of childhood lead poisoning in a specific target area, and identification of children with abnormal blood lead levels. A concurrent study of potential sources would permit the development of a methodology for controlling childhood lead poisoning.

The target area was selected with the aid of a model designed by the Bureau of Community Environmental Management adapted to the Pittsburgh area. The model was designed to produce a ranking of possible high-risk lead poisoning areas. The results produced four neighborhoods as potential target areas. The County Health Department chose the Turtle Creek Valley as the target area. The monitoring program was conducted by graduate students from Carnegie-Mellon University in Pittsburgh.

Monitoring Program

Three environmental factors were chosen for consideration for their influence on the level of lead in the blood of children. They are: housing conditions, soil, and industry. These factors were chosen in conjunction with the preliminary health screening findings of the elevated blood lead levels (EBL) of children in the target area.

Housing conditions were inspected and showed the existence of flaking or peeling paint, slightly warping broken windows, and generally a need for some repair work. There was also evidence of large amounts of garbage and debris surrounding the houses. These deteriorated housing conditions could be possible sources for the ingestion of lead.

A survey of the industries in the area revealed that the steel industry is a potential contributor to lead pollution. However, there is no documented data on lead, apart from the general knowledge that coal combustion contributes about 920 tons of lead nationally per year from stacks. This would suggest that steel production is contributing an insignificant level of lead to the ambient environment in the study area.

Two surveys were conducted by the Allegheny County Health Department on June 12 and 15, 1973 in order to determine the lead content of soil. This was done throughout the study area by dividing a map of the area into a 10x10 grid and selecting random coordinates in order to mark sample locations. The samples were taken as close to the mark location as possible. If the location was near an intersection of streets, the sample was taken at curbside. The samples at locations near specific houses were taken on the sidewalk in front of the houses. About one tablespoon of surface dirt and dust was collected at 27 locations. The samples were subsequently analyzed for lead using atomic absorption spectroscopy. One sample was lost, so 26 lead measurements were made. Additional samples at nine locations were taken in high incidence areas. These were taken at the curbside of the street intersections in that area. The sampling procedure was similar to the first one.

After this survey showed possible correlation between the EBL incidence and the lead content of soil, a second soil survey was designed and conducted to provide better evidence of correlation. Also, a secondary objective was to investigate the distribution pattern of lead in soil. The sites for sampling were selected at the homes of some of the children who were screened for EBL. It was assumed in this survey that the lead content of the soil would accurately reflect the general lead concentration in the child's outdoor environment. This was premised on the finding that lead concentration in soil is higher in industrial areas than in residential areas. It was suggested that the lead level in the soil should be a function of the industrial situation as well as traffic volumes in the sample areas.

Three groups of sample locations were selected. There were 11 pairs of samples for the control group, 11 pairs for a group referred to as the high group and three pairs from the high EBL incidence. For each pair, a sample was taken within one foot of each other for each location. The sampling procedure was to scoop up several teaspoons of surface dirt and dust with a plastic spoon and place them in sterilized plastic bags. All samples were taken at curbside, except the three pairs in the high EBL incidence block (which were taken between row houses) in front of the houses. Analyses were performed by the County Health Department using atomic absorption spectroscopy.

Results and Discussion

The results of the first soil survey are shown in Figure 7. Sample No. 5 shows a very large value, in comparison with others, of 8370 micrograms of lead per gram of soil. It was taken below the Rankin Bridge which has a large flow of truck traffic and could account for the unusually

SOIL SURVEY DATA - A.C.H.D.

Location	Reading $\left(\frac{\mu g \text{ lead}}{g \text{ soil}}\right)$
SURVEY #1	RANDOM
1	20
2	214
3	54
4	32
5	8,370
6	481
7	481
8	114
9	420
10	765
11	570
12	185
13	997
14	605
15	943
16	1,620
17	712
18	623
19	1,030
20	1,820
21	140
22	1,020
23	926
24	lost
25	247
26	112
27	167
SURVEY #2 SELECTED	
28	3,360
29	516
30	481
31	1,570
32	314
33	246
34	2,080
35	352
36	2,780

FIGURE 7
ALLEGHENY COUNTY PRELIMINARY SOIL SURVEY DATA

high reading. For this reason, the statistical analysis was performed in the report without that value, that is, with the other 25 values and referred to as Survey 1-A. The levels of lead found in the soil sampled might not necessarily reflect the actual levels of lead in the soil. This is borne out by the wide variations in values within each area and between the two adjacent areas which were only one block apart. There was no discernible difference in traffic or industrial activity in the areas. The results show the following statistical characteristics:

TABLE 6

SUMMARY OF SURVEY RESULTS

	Survey 1A	Survey 2
Range of Values	20 - 182 (μg/g)	246-336 (μg/g)
Mean	570 (μg/g)	1300 (μg/g)
Standard Deviation	485	1190

The large variations might be caused by inherent errors in the sampling procedure or in the actual measurement method. There is also the possibility that lead is distributed in packets or in a non-linear way which would give rise to a large variation within a small area. The control and site limitations of both surveys hindered a meaningful conclusion from the results. Consequently, a new survey was designed.

The data for the 50 samples of the second survey are shown in Figure 8. A great deviation between sample pairs can be seen in the data. The range of this deviation was from 45 to 1258 μg/g, with deviations as great as 100% of the lower pair value not uncommon. The statistical features are shown below.

SOIL SURVEY DATA

Location	Reading μg lead / g soil	Blood Lead Level
1 a	650	46
b	605	
2 a	640.5	60
b	498.5	
3 a	1192	70
b	534	
4 a	800.5	76
b	729	
5 a	292	54
b	605	
6 a	712	72
b	306	
7 a	836	45
b	980	
8 a	463	110
b	854	
9 a	569	54
b	783	
10 a	551	61
b	366	
11 a	551	60
b	427	
12 a	783	39
b	980	
13 a	1460	30
b	729	

Location	Reading μg level / g soil	Blood Lead Level
14 a	374	34
b	211.9	
15 a	605	30
b	463	
16 a	818	37
b	747	
17 a	498	18
b	426.5	
18 a	284.5	33
b	720	
19 a	712.5	40
b	1174	
20 a	444.9	31
b	890	
21 a	640.5	25
b	694	
22 a	1352.5	39
b	1014.	
23 a	533.9	50
b	782.5	
24 a	515.5	50
b	185	
25 a	60.5	50
b	1318.5	

FIGURE 8
ALLEGHENY COUNTY PRELIMINARY SOIL SURVEY DATA

TABLE 7

SURVEY STATISTICS (μg lead/g soil)

	High Group	Control Group
Survey size	22	22
Range of values	292-1192	211.9-1352.5
Mean	633.8	730
Standard Deviation	218.5	322.7

The six samples in the high incidence block had a mean of 566. The largest deviation occurring between sample pairs was found in this set, thus no further statistical computation was done on these. The small size of this set would aggravate the meaningless comparison with the other sample locations. The data showed a smaller overall range of values than the preliminary surveys, but the variations were still too great. Therefore, the hypothesis of a positive correlation between EBL incidence and lead content of soil was rejected.

Conclusions

The following are the summary conclusions:

1. Lead in soil is not a reliable indication of where to test for EBL.
2. It might prove worthwhile to learn more about the distribution of lead, since the Pittsburgh area seems to have a low EBL incidence as well as a low level in the soil.

3. It might be useful to investigate the EBL and soil lead content in other cities for comparison with Pittsburgh.
4. The dust samples collected in dwellings might be a useful indicator of potential sites for EBL testing.

Colorado Department of Health, Division of Engineering and Sanitation

The Division of Engineering and Sanitation is responsible for monitoring the quality of all drinking water supplies in the State of Colorado, with the exception of supplies administered by the Denver Board of Water Commissioners. (As noted in the previous section, the latter supplies are monitored by the Board with analysis reports included in the STORET system.) The supplies monitored by the Division now number over 900, with each supply being sampled about once every two or three years. Analyses are performed for parameters which have Public Health Service standards, and these include arsenic, cadmium, cyanide, and lead from the list of toxic substances of interest. The standards for the toxic substances are shown in Table 8.

As the previous section describing the data collection meeting with Engineering and Sanitation Division officials pointed out, data for the period 1971 to the present is now in the process of being compiled for publication and should be available by early 1975. Since all the original data required is part of this compilation, there appears to be no reasonable way to acquire the data any earlier. The data had not been received at the time this report was prepared.

The published report of all data for the period 1965-1970 was obtained at the meeting in Colorado. Although the current years of interest are not included, it may be useful to describe that data here as a preview of the more current data, which will be forthcoming later. Figure 9 shows an actual data sheet from the report. With similar sheets

TABLE 8

COLORADO STANDARDS (ALLOWABLE LIMITS) FOR TOXIC SUBSTANCES IN DRINKING WATER

TOXIC SUBSTANCE	CONCENTRATION, mg/l
Arsenic	0.05
Cadmium	0.01
Cyanide	0.20
Lead	0.05

Source: Colorado Department of Health, Colorado Drinking Water Supplies, February, 1971.

Chemical values in mg/1 Radioactivity in picocuries per liter does include standard error correction	Arsenic (As)	Cadmium (Cd)	Chromium (Cr^{+6})	Fluoride (F)	Lead (Pb)	Selenium (Se)	Barium (Ba)	Cyanide (CN)	Gross Alpha Activity	Gross Beta Activity	Radium 226	Total Hardness	Calcium (Ca)(as $CaCO_3$)	Magnesium (Mg)	Total Solids	Methylene Blue Active Surfactants	Copper (Cu)	Zinc (Zn)	Iron (Fe)	Manganese (Mn)	Chloride (Cl)	Nitrate (NO_3)	Sulphate (SO_4)
2/70 01011 Baker Metro 01021 5/68	0	0	0	1.1	0	.004	-	-	15.0± 12.1	10.8± 9.4	0.12± 0.09	248	168	19	515	0	0	0	.10	0	22	0	197
Bennett 01031 6/70	0	0	0	1.8	0	0	-	-	IFB	-	-	38	20	4	408	0	0	0	0.05	0	16	0	36
Brighton 01041 2/70	0	0	0	1.1	0	.002	-	-	-	-	-	616	438	44	1332	0	0	.005	0	0	176	40	435
Eastlake 01051 10/65	0	0	0	2.0	0	0	-	-	IFB	IFB	-	12	4	2	326	0	0	0	.17	0	8	0	26
Federal Heights 01061 2/70	SEE WESTMINSTER																						
High Plains 01071 3/66	0	0	0	1.1	0	0	-	-	IFB	IFB	-	16	8	2	492	0	0	0	.03	0	32	0	0
Mile High Water Co. 01081 2/70	0	0	0	2.[illegible]	0	0	-	-	IFB	IFB	-	12	8	1	602	-	0	0	0.20	0	63	0	4
Mountain View 01091 2/70	0	0	0	1.3	.05	0	-	-	IFB	IFB	-	12	4	4	401	0	.09	0	.05	0	33	0	0
No. Wash. Wtr. Wors. 01111 2/70	0	0	0	1.4	0	0	-	-	IFB	IFB	-	16	8	2	500	0	.40	0	.05	0	39	0	0
South Adams 01121 6/69	0	0	0	1.2	0	0	-	-	[illegible]± 10.7	IFB	IFB	21[illegible]	168	10	463	0	0	0	.13	0	40	0	136
Thornton 01131 2/70	0	.0[illegible]	0	.35	0	0	-	-	IFB	IFB	-	102	76	6	366	0	0	0	0.[illegible]	0	30	6	1[illegible]6
Town & Country 01141 2/70	0	0	0	.7	0	0	-	-	[illegible]± [illegible]	IFB	0.11± 0.10	388	352	9	[illegible]	.172	0	2.8	[illegible]	[illegible]	[illegible]	1.9	247
Westlake 01151 2/70	0	0	0	1.5	0	0	-	-	[illegible]± 11.8	IFB	[illegible]± 0.11	19	8	3	752	0	0	0	.02	[illegible]	[illegible]	0	0
Westminster 01161 7/68	0	0	0	1.0	0	0	-	-	7.[illegible]± 12.[illegible]	IFB	-	54	40	3	585	0	0	0	.11	0	9	0	227
Mills Subdivision	0	0	0	1.0	0	0	-	-	IFB	-	-	43	18	6	184	0	0	0	0.05	.005	5	0	21

Page 7

FIGURE 9
DATA SHEET FROM COLORADO REPORT ON QUALITY OF DRINKING WATER

for 1971---present, data can be extracted on water supply location, date of sample, toxic substance, and analysis result in milligrams per liter. According to Health Department laboratory personnel, atomic absorption is used for all water quality analysis.

Since Division officials stated that there has been no significant change in results over the years, a brief summary of the 1965-1970 data should indicate what is to be expected when the current data is received. During the 1965-1970 years, 1,220 analyses were run for the toxic substances of interest. Until 1967, all tests for these substances were negative, and in no case was cyanide detected from 1965-1970. Three times in 1970 arsenic was detected, but levels were well under allowable limits. Lead was detected in seven samples in 1969 and 1970 at levels within allowable limits. Cadmium was the most frequently detected of the infrequently detected toxic substances --- 11 times in the period 1967-1970. As with the other substances, all cadmium values were within acceptable limits for drinking water. The principal reasons for the low levels were (1) sources selected as drinking water supplies were rather pure to begin with; and (2) treatment to further purify water will often have the ancillary effect of removing some of the toxic substances (all samples were taken after the water had been purified). Table 9 summarizes the 1965-1970 data for the years that toxic substances were detected.

TABLE 9

TOXIC SUBSTANCES IN COLORADO DRINKING WATER (mg/1)

Toxic Substance	No. of Detections	Min.	Max.	Mean
		1967		
Arsenic	-0-	-0-	-0-	-0-
Cadmium	1	0.016	0.016	0.016
Lead	-0-	-0-	-0-	-0-
		1968		
Arsenic	-0-	-0-	-0-	-0-
Cadmium	2	0.003	0.004	0.0035
Lead	-0-	-0-	-0-	-0-
		1969		
Arsenic	-0-	-0-	-0-	-0-
Cadmium	4	0.002	0.010	0.005
Lead	3	0.005	0.020	0.012
		1970		
Arsenic	3	0.004	0.009	0.006
Cadmium	4	0.002	0.009	0.005
Lead	4	0.010	0.100	0.045

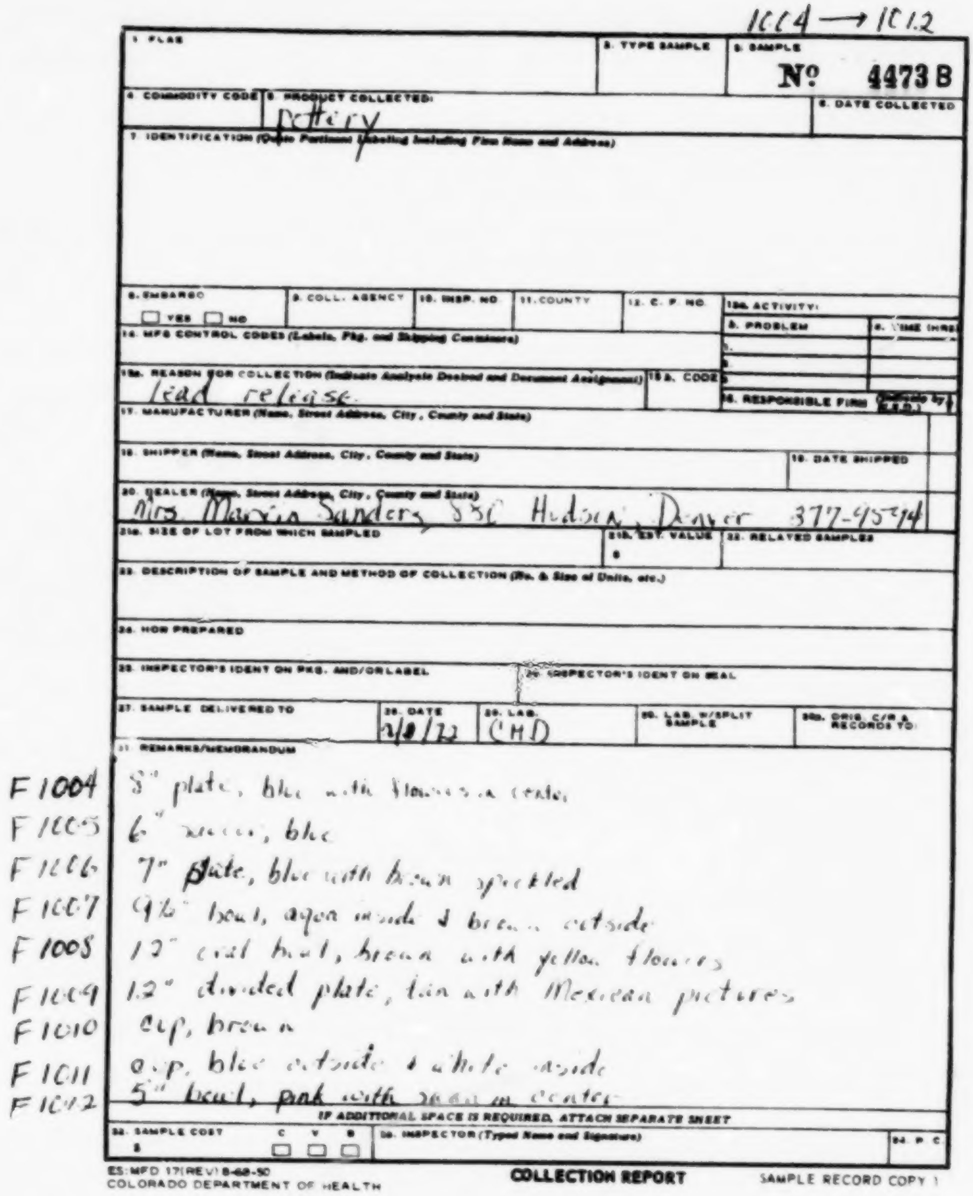
Colorado Department of Health; Milk, Food, and Drug Division

The Milk, Food, and Drug Division of the Colorado Department of Health does not have the resources for routine monitoring of toxic substances. Therefore, it is responsible for the monitoring and analysis of toxic substances only in response to citizen complaints or suspicions regarding food and materials.

The principal toxic substance monitored by the Milk, Food, and Drug Division was lead. Data studied dealt specifically with the lead content contained in various forms of pottery.

Samples were submitted from all parts of Colorado, with the majority coming from the Boulder and Denver areas. There were also two samples submitted from localities outside of Colorado--one from New Jersey and one from St. Thomas, Virgin Islands. The pottery originated from all over the world with a major portion coming from Mexico. The other countries or states were Italy, Finland, Germany, Japan, England, Greece, Taiwan, Portugal, France Denmark, Sweden, Wales, Iran, the Virgin Islands, New Jersey, California and Vermont.

For the period of time from 1971 to the present, approximately 800 samples were received from individuals questioning the lead content in earthenware. Only samples actually sent to the Department of Health were analyzed for toxic lead levels. The data was transmitted to MITRE on standard forms used by the Food, Milk, and Drug Division. Figures 10 and 11 are samples of the forms used. A format was then



1004 → 1012

1. FLAG

2. TYPE SAMPLE

3. SAMPLE No 4473 B

4. COMMODITY CODE

5. PRODUCT COLLECTED: pottery

6. DATE COLLECTED

7. IDENTIFICATION (Quote Pertinent Labeling Including Firm Name and Address)

8. EMBARGO ☐ YES ☐ NO

9. COLL. AGENCY

10. INSP. NO.

11. COUNTY

12. C. F. NO.

13a. ACTIVITY:

b. PROBLEM

c. TIME (HRS)

14. MFG CONTROL CODES (Labels, Pkg. and Shipping Containers)

15a. REASON FOR COLLECTION (Indicate Analysis Desired and Document Assignment) lead release

15b. CODE

16. RESPONSIBLE FIRM (Indicate by ✓)

17. MANUFACTURER (Name, Street Address, City, County and State)

18. SHIPPER (Name, Street Address, City, County and State)

19. DATE SHIPPED

20. DEALER (Name, Street Address, City, County and State) Mrs Marvin Sanders 530 Hudson, Denver 377-9594

21a. SIZE OF LOT FROM WHICH SAMPLED

21b. EST. VALUE $

22. RELATED SAMPLES

23. DESCRIPTION OF SAMPLE AND METHOD OF COLLECTION (No. & Size of Units, etc.)

24. HOW PREPARED

25. INSPECTOR'S IDENT ON PKG. AND/OR LABEL

26. INSPECTOR'S IDENT ON SEAL

27. SAMPLE DELIVERED TO

28. DATE 2/8/72

29. LAB. CHD

30. LAB. W/SPLIT SAMPLE

30a. ORIG. C/R & RECORDS TO:

31. REMARKS/MEMORANDUM

F1004 8" plate, blue with flowers in center

F1005 6" saucer, blue

F1006 7" ~~p~~late, blue with brown speckled

F1007 9½" bowl, aqua inside & brown outside

F1008 12" oval bowl, brown with yellow flowers

F1009 12" divided plate, tan with Mexican pictures

F1010 cup, brown

F1011 cup, blue outside & white inside

F1012 5" bowl, pink with [illegible] in center

IF ADDITIONAL SPACE IS REQUIRED, ATTACH SEPARATE SHEET

32. SAMPLE COST $ C ☐ V ☐ S ☐

33. INSPECTOR (Typed Name and Signature)

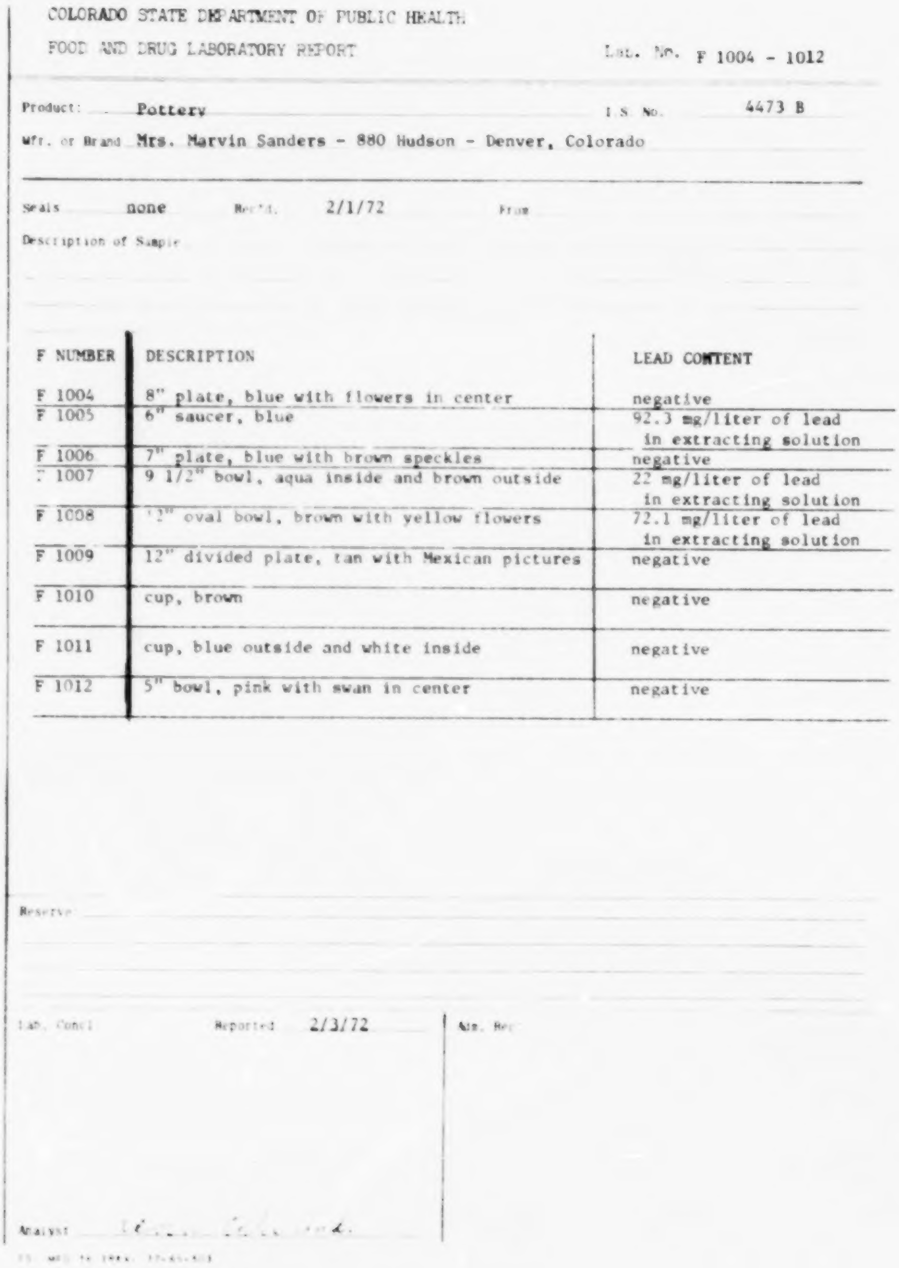
34. P. C.

ES:MFD 17(REV) 8-68-50
COLORADO DEPARTMENT OF HEALTH

COLLECTION REPORT

SAMPLE RECORD COPY 1

FIGURE 10
COLORADO HEALTH DEPARTMENT SAMPLE COLLECTION REPORT



COLORADO STATE DEPARTMENT OF PUBLIC HEALTH
FOOD AND DRUG LABORATORY REPORT

Lab. No. F 1004 - 1012

Product: Pottery

I.S. No. 4473 B

Mfr. or Brand Mrs. Marvin Sanders - 880 Hudson - Denver, Colorado

Seals none

Rec'd. 2/1/72

From

Description of Sample

F NUMBER	DESCRIPTION	LEAD CONTENT
F 1004	8" plate, blue with flowers in center	negative
F 1005	6" saucer, blue	92.3 mg/liter of lead in extracting solution
F 1006	7" plate, blue with brown speckles	negative
F 1007	9 1/2" bowl, aqua inside and brown outside	22 mg/liter of lead in extracting solution
F 1008	12" oval bowl, brown with yellow flowers	72.1 mg/liter of lead in extracting solution
F 1009	12" divided plate, tan with Mexican pictures	negative
F 1010	cup, brown	negative
F 1011	cup, blue outside and white inside	negative
F 1012	5" bowl, pink with swan in center	negative

Reserve

Lab. Concl

Reported 2/3/72

Adm. Rec

Analyst

FIGURE 11
COLORADO HEALTH DEPARTMENT SAMPLE ANALYSIS REPORT

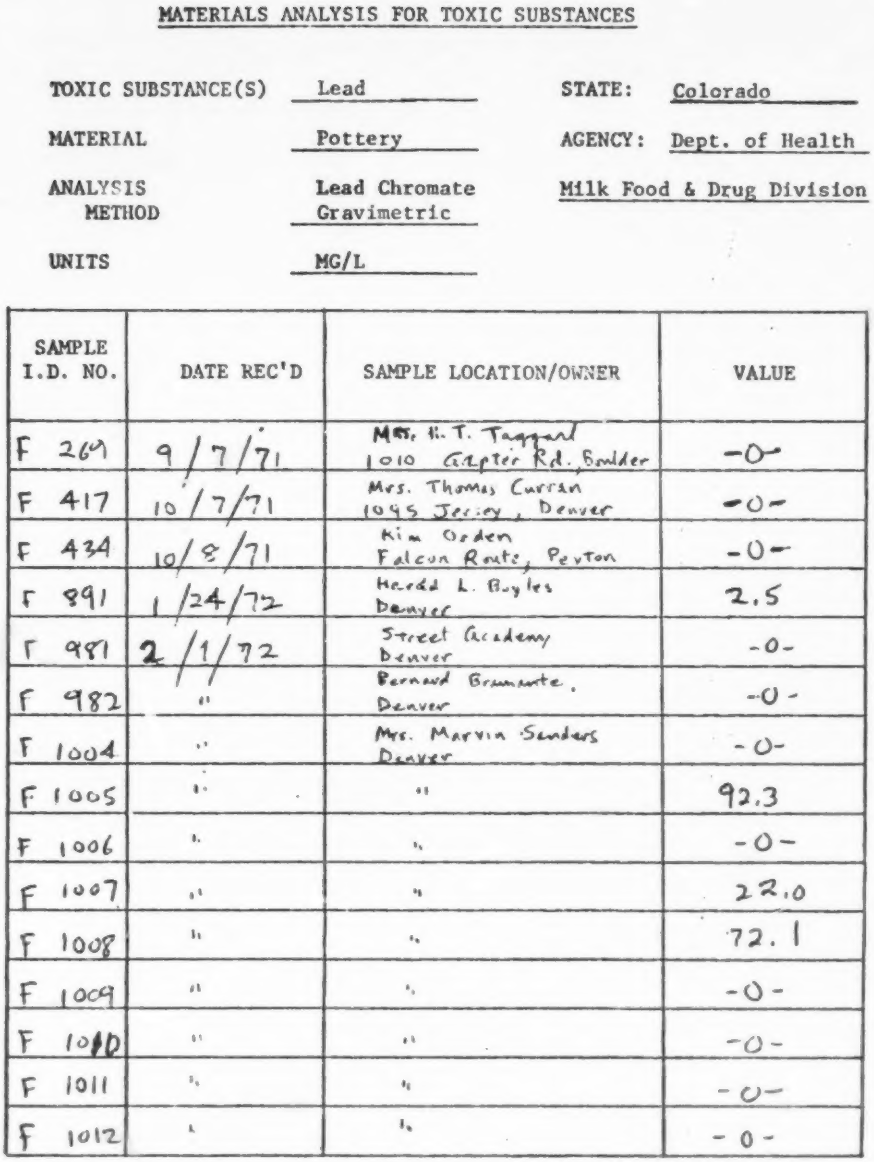
devised by MITRE to organize the data according to sample number (assigned by the Milk, Food, and Drug Division), sample location and owner, date received, analysis method, and value in milligrams per liter. A sample of the MITRE form is shown in Figure 12.

In all samples submitted, the lead chromate gravimetric analyses were performed.

Examination of the data showed that 687 or 83.5 percent of all pottery tested had a lead content of zero. Of the remaining 137 values, 93, or 68 percent, had lead levels over the seven milligrams per liter standard established by the Food and Drug Administration. The values above zero were unevenly distributed, peaking with fifteen values between 2-3, twelve between 0-20, and twelve between 100-200. There were also six values above 1000, the highest being 4480. This highest value exceeded the Food and Drug Administration standard 640 times. The peak year of citizen interest in lead, as the data indicates, was 1972 with 678 samples.

The data presented here did not lend itself to a scientific trend analysis primarily because scientific sampling of the environment was not employed. Samples were obtained only when the presence of lead was suspected, and no standards were established for sample collection. In the summary and analysis of the data, since there was a predominance of values at zero, calculating a standard deviation would have been misleading and therefore was not done.

Figure 13 and Table 10 summarize the results of the data analysis.



MATERIALS ANALYSIS FOR TOXIC SUBSTANCES

TOXIC SUBSTANCE(S) Lead
MATERIAL Pottery
ANALYSIS METHOD Lead Chromate Gravimetric
UNITS MG/L
STATE: Colorado
AGENCY: Dept. of Health
Milk Food & Drug Division

SAMPLE I.D. NO.	DATE REC'D	SAMPLE LOCATION/OWNER	VALUE
F 269	9/7/71	Mrs. H. T. Taggart 1010 Grapter Rd., Boulder	-0-
F 417	10/7/71	Mrs. Thomas Curran 1095 Jersey, Denver	-0-
F 434	10/8/71	Kim Orden Falcon Route, Peyton	-0-
F 891	1/24/72	Harold L. Boyles Denver	2.5
F 981	2/1/72	Street Academy Denver	-0-
F 982	"	Bernard Bramante, Denver	-0-
F 1004	"	Mrs. Marvin Sanders Denver	-0-
F 1005	"	"	92.3
F 1006	"	"	-0-
F 1007	"	"	22.0
F 1008	"	"	72.1
F 1009	"	"	-0-
F 1010	"	"	-0-
F 1011	"	"	-0-
F 1012	"	"	-0-

FIGURE 12
FORM FOR RECORDING COLORADO LEAD IN POTTERY DATA

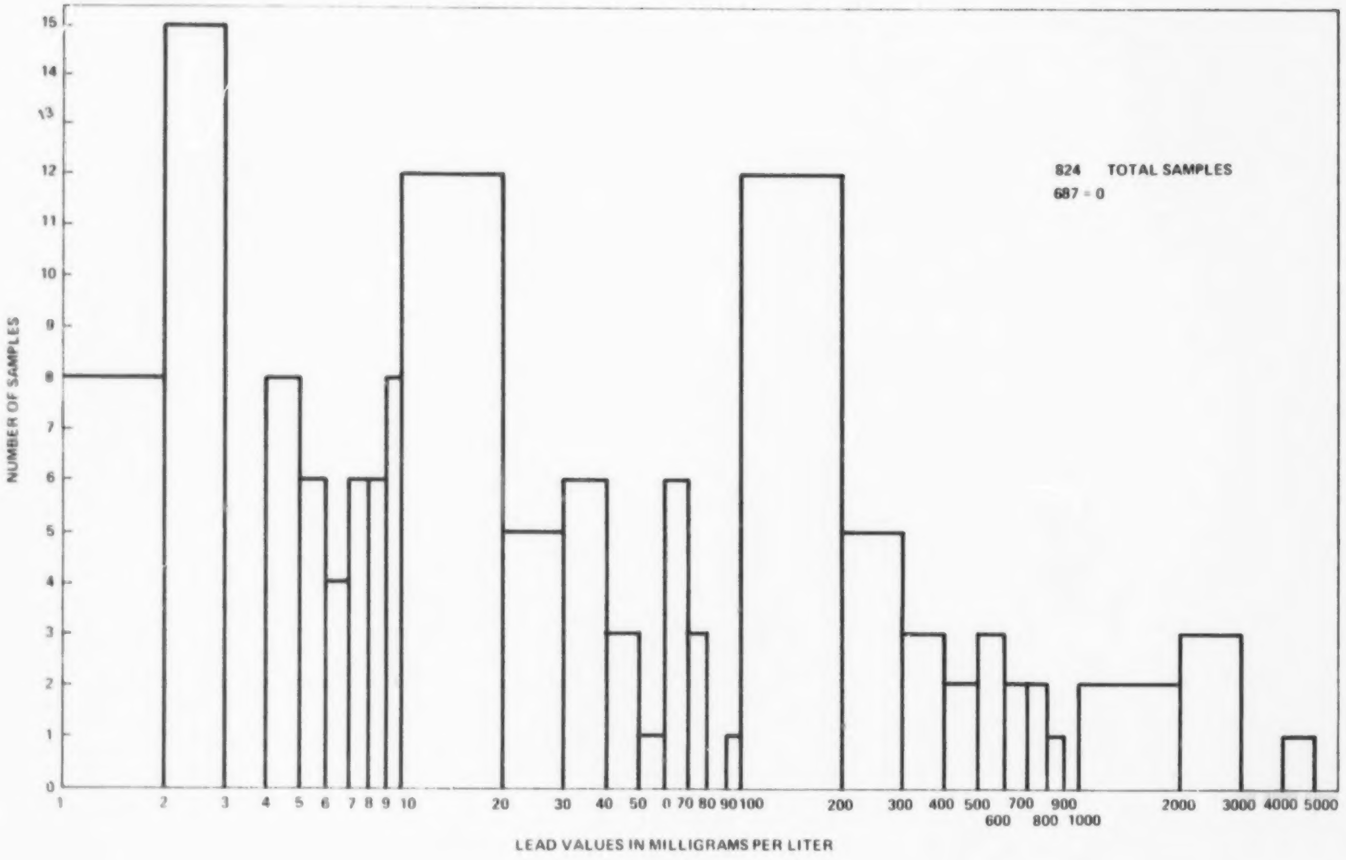


FIGURE 13
DISTRIBUTION OF LEAD IN POTTERY VALUES FOR COLORADO

TABLE 10

LEAD IN POTTERY IN COLORADO

NO. OF SAMPLES	MINIMUM VALUE	MAXIMUM VALUE	MEAN
1971			
3	0	0	0
1972			
678	0	4480	33
1973			
98	0	1084.3	25
1974			
45	0	1094.3	38

Colorado Department of Natural Resources, Wildlife Division

The Colorado data on effects of lead and cadmium on wildlife was by far the most difficult to categorize, transform to a standardized format, and analyze in any meaningful way. The main reasons for this are that samples were taken only from a few small areas, and generally only a small number of samples were taken over a very short time period for limited, special study purposes. To further complicate analysis, results of tissue analysis were frequently lumped together for a given site and sampling date so that only composite data is available. Wildlife Division officials concurred that their data would be of only limited usefulness to OTS for environmental trend monitoring, and that the main conclusion to be drawn from the data was simply that fish, insect, and bird tissue tends to accumulate heavy metals even when these are present in very low concentrations in the natural environment.

The Division of Wildlife has been monitoring streams, fish, birds and insects over several years to ascertain the presence of some toxic substances. One of the reasons for this study is to determine the effects of mineral mining and milling operations on high mountain streams and, consequently, on the fauna and flora of such bodies of water. Another aspect of the study also involved bioassay studies wherein fish and insects are exposed to varying concentrations of toxic substances and then watched for development of defects. The water quality data on the streams include some heavy metals, such as cadmium and lead. This data has been reported to EPA for inclusion in STORET. The analyses that were done on tissues of fish, insects and birds include data for cadmium and lead which are among the seven toxic substances being considered.

There are three reports for monitoring done in 1971, 1972, and 1973, on streams and biota, and one report done between October, 1973, and March, 1974, on tissues of Canada Geese. The 1971 and 1972 monitoring involved four study areas each, while the 1973-74 studies were confined to only one area, Williams Fork River near Parshall, Colorado, and Turk's Pond in southwestern Colorado, respectively. The features of each study will be discussed below.

1971 Study Monitoring Program

This study was conducted over four study areas, namely: Creede, Lake City, Silverton and Climax. Water quality for the four study areas was sampled quarterly during calendar 1971, at established sampling sites. These results have been submitted to STORET. Cadmium and lead were the only toxic substances of interest that were determined during this period. Aquatic insect and fish samples were sampled during September. In the Creede study area, the insects were collected on 6 September, with three, one-square-foot bottom samples, and because of their small size, were not identified beyond order. No fish were captured at stations 1 and 2, but some brown trout were collected in the vicinity of station 3 by electro-fishing, which is a method of applying electric current to the water and stunning the fish within two to five feet.

A diverse insect fauna comprised of mayflies, stoneflies, caddisflies and midges was found at all stations in the Lake City study area. Two brook trout and two rainbow trout were collected at station 1; seven brown trout were collected at station 2; twenty-one brown trout and one rainbow trout were collected at station 3; and one brook trout, five brown trout and one rainbow trout were collected at station 4.

For the Silverton study area, one mayfly and one stonefly were collected at station 1; twenty-nine insects per square foot were sampled at station 2; and over three hundred midges per square foot at station 6; as against only three per square foot nine days earlier. No fish were collected at stations 1, 3, 7, and 8, but some brook trout were collected at stations 2, 4, and 5.

For the Climax study area, the total number of insects sampled at all stations was just about 10 percent of those sampled in 1970, probably because of high water flow at the time of sampling. Thus, no data was provided. Twelve immature rainbow trout and two brown trout were captured at station 1; one brown trout was collected at station 2; eight brook trout, one brown trout and two rainbow trout were collected at station 3. Station 4 produced four brown trout; and station 7 produced seven large brown trout.

In addition to analysis of these natural samples, bioassays designed to measure the effects of lead on growth and reproduction in hard and soft water were done with rainbow trout that weighed 6 grams and were 83 mm long. The tests started in May, 1970 and were terminated after 19 months of exposure to lead. Bioassays were also conducted on two stoneflies and one mayfly with lead and cadmium in the Creede study area using well water of medium softness (70 mg/l $CaCO_3$). In the bioassay tests, the fish and insects were exposed to different concentrations of lead, cadmium and other toxic metals in aquaria. Observations were recorded regarding physical abnormalities, growth, reproduction and mortality rates. This data is available at EPA.

1972 Study Monitoring Program

The same study areas as described above were used in this study. Water quality analyses were performed and reported to the STORET system. A series of acute bioassays was conducted with lead. Several of the tests were used to examine the effects of variables such as fish size, water temperature and hardness on the toxicity of a metal. Others were used to develop application factors, while another set of tests was done to evaluate the toxic action of heavy metals in combination, that is, the synergistic effect, in which lead was combined with zinc and copper.

Two chronic bioassays for lead were done with eyed rainbow trout eggs to determine the effects of lead on eggs and to investigate if there is any acclimatization effect as a result of the exposure of eyed eggs to the metal, as was found with zinc.

Fish tissues from samples collected during September of 1969, 1970, and 1971, were treated and analyzed by atomic absorption spectrophotometry for toxic metals including cadmium and lead.

A mayfly and a stonefly were used as test organisms to investigate the effects of heavy metals on aquatic insects. It was thought that this would allow the comparison of the relative toxicity of metals to fish and insects as the latter could probably be used as indications of metal contamination in water. The insects were selected because of their herbivorous nature and their abundance in the Rio Grande River in the Creede area. They were fed willow leaves during the tests.

Another set of 500 stoneflies was collected from the Rio Grande in Creede in 1971 and kept in aquaria for tests in 1972. Mayflies were collected in May and June and acute bioassays were conducted. Two other bioassays were conducted at the Creede Hatchery. One was subchronic bioassay with both species exposed to Willow Creek water for 16 days. The other was a two-month exposure of both species to varying proportions of Willow Creek water. Water samples and insect times were analyzed for metal accumulation.

1973 Study Monitoring Program

The Williams Fork River near Parshall, Colorado, was sampled routinely during 1973. Interest in the area stemmed from the construction of additional facilities by American Metals Climax, Inc. The Creede study area was sampled once in June, 1973, because of the imminent resumption of operations by Emperius Mining Company. Tissues from brown trout, averaging about 250 mm in length, collected from the Cache la Poudre River were analyzed for heavy metals. Four stations in the Williams Fork area were sampled three times in 1973: June 27, August 24, and November 15. Aquatic insects were collected with a kick screen on August 24, 1973. Water samples were analyzed as in the past and data from the water quality analyses has been reported to STORET.

Data Interpretation/Discussion

1971 Study: There are no tabulated data shown in the report, but it is stated that caddisflies in Creede study area contained 526 µg/g lead, while stoneflies were found with levels between 0 and 80 µg/g lead.

For the Lake City study area, it is reported that mayflies contained 850 mg/g of lead and caddisflies contained 1240 µg/g of lead.

At Silverton, 1900 µg/g of lead was reported in mayflies. No data or results were reported for the Climax study area.

Results were recorded on the bioassay investigations, but these represent laboratory monitoring studies under controlled conditions, rather than analysis of samples for environmental effects.

1972 Study: The water quality data in the report which was reported to STORET, consists of 16 data sheets from the quarterly sampling of the four study areas. None of these results indicate any detection of cadmium or lead or any of the toxic substances of interest to this project. Surprisingly, the tissue analysis shows varying levels of these metals for all tissues from different species of trout taken from the stream in the same study areas (the tissue data is included here in Figure 14). Two conclusions can be inferred from this situation. First, fish tissues invariably seem to concentrate cadmium and lead from an aquatic environment which registered no toxic substances in the analytical tests performed.

Appendix C1. Climax Study Area 1969

					Tissue metal concentration (µg/g)					
Sta.	Spec.	No.	Size (mm)	Tissue	Zn	Cu	Pb	Ag	Cd	Mo
1	Bk	6	50-90	Gill	490.8	12.8	8.5	1.3	4.3	0
				Bone	983.2	8.9	10.7	1.2	8.9	0.0
				Eye	99.9	18.4	0.0	0.3	0.0	0.0
				Skin & Scales	138.8	13.9	0.0	0.0	1.2	0.0
	Rb	8	65-95	Head	885.7	7.8	14.2	1.1	14.9	10.7
				Viscera	146.7	6.3	1.0	0.7	0.0	0.0
				Muscle	427.8	6.5	3.7	0.4	3.3	2.9
2	Bk	4	125-375	Gill	472.8	2.5	2.1	0.6	5.9	0.0
				Bone	1399.3	3.1	21.2	2.0	24.3	0.0
				Eye	59.4	3.2	0.0	0.1	4.1	0.0
				Skin	138.6	3.0	3.6	0.2	1.3	0.0
3	Bk	2	150-200	Gill	902.6	10.6	185.4	0.6	16.1	0.0
				Bone	3165.7	13.0	0.0	1.9	46.6	0.0
				Eye	92.3	17.1	6.8	0.3	0.0	0.0
4	Bn	3	100-425	Gill	705.2	2.5	3.3	0.7	12.7	0.0
				Bone	2033.9	3.7	19.4	1.7	41.8	4.5
				Eye	108.4	6.4	0.0	0.1	0.0	0.0
				Skin	143.8	3.8	0.0	0.0	1.6	0.0
				Stomach	447.2	15.6	10.2	0.0	1.2	23.7
				Spleen	371.6	18.3	10.8	0.0	0.0	6.8
5	Bn	6	200-450	Gill	455.3	3.9	9.6	0.5	4.6	0.0
				Bone	932.6	3.3	21.3	1.8	18.7	0.9
				Eye	52.3	4.4	0.0	0.2	0.0	0.0
				Skin	150.7	3.4	8.1	0.1	0.0	0.0
				Stomach	289.5	7.5	2.7	0.0	0.0	0.0
				Spleen	362.4	7.1	0.0	0.0	0.0	0.0
6	Bk	2	75-105	Head	675.6	6.0	5.5	0.5	17.0	0.0
				Viscera	34.9	2.9	0.0	0.2	0.0	0.0
				Muscle	206.8	4.9	0.0	0.0	3.1	0.0

FIGURE 14
COLORADO DATA ON HEAVY METAL CONCENTRATIONS IN TISSUE

Appendix C2. Climax Study Area 1970

Sta.	Spec.	No.	Size (mm)	Tissue	Tissue metal concentration (μg/g)					
					Zn	Cu	Pb	Ag	Cd	Mo
1	Bn	2	70	Wh. Fish	267.4	4.6	0.7	0.9	3.0	0.0
	Rb	3	70	Wh. Fish	387.9	5.2	8.7	0.8	3.0	4.8
2	Bn	2	220-325	Gill	317.6	3.0	12.5	1.1	16.2	0.0
				Bone	290.4	4.4	18.6	2.7	2.5	5.3
				Eye	1691.4	3.9	0.0	0.2	2.5	0.0
				Skin	439.1	4.3	0.0	0.1	4.1	0.0
				Stomach	1165.9	8.4	0.0	0.0	3.1	0.0
				Intest.	1068.9	19.8	0.0	0.0	15.75	0.0
				Liver	275.3	259.6	1.3	2.2	25.9	0.0
3	Bk	3	100-130	Head	364.6	3.1	4.6	1.1	0.0	0.0
				Muscle	181.5	3.6	2.2	0.6	1.2	0.0
	Bn	4	85-110	Head	344.7	3.8	4.2	1.1	3.4	0.0
				Muscle	154.1	2.6	0.7	0.4	0.7	0.0
	Bn	2	170-200	Gill	487.3	2.4	5.4	0.3	12.7	5.4
				Bone	592.3	3.5	20.9	1.7	15.7	7.0
				Eye	2613.4	2.0	0.0	0.0	4.7	0.0
				Skin	352.2	2.5	0.0	0.0	0.0	0.0
				Stomach	879.2	6.9	0.0	0.0	9.6	0.0
				Intest.	1348.1	20.3	0.0	0.0	34.9	0.0
				Liver	430.8	22.1	0.0	0.6	13.1	5.0
	Rb	6	145-220	Gill	285.3	4.2	6.2	0.5		
				Bone	291.5	3.8	26.4	2.0	4.0	1.6
				Eye	667.5	3.0	0.0	0.0	4.8	11.5
				Skin	293.9	3.5	0.0	0.0	0.0	0.0
				Stomach	386.8	12.3	0.0	0.0	5.7	0.0
				Intest.	452.6	20.0	0.0	0.0	0.0	0.0
				Liver	362.9	442.8	0.0	1.0	1.1	6.3
4	Bn	6	190-240	Gill	357.2	4.4	5.5	1.2	12.1	4.0
				Bone	380.9	4.8	19.5	1.7	7.6	12.8
				Eye	2331.9	3.4	0.0	0.0	1.0	0.0
				Skin	592.0	3.7	0.0	0.2	1.5	0.0
				Stomach	807.8	16.5	0.0	0.0	8.5	3.5
				Intest.	1657.7	40.4	0.0	0.0	27.9	0.0
				Liver	428.9	456.2	0.0	2.4	19.5	0.0
5	Bn	9	180-260	Gill	227.5	2.7	8.7	0.7	4.6	4.9
				Bone	196.2	3.2	21.9	1.9	8.2	12.5
				Eye	1681.1	2.1	0.5	0.0	0.9	0.0
				Skin	246.5	3.6	0.5	0.0	2.0	0.0
				Stomach	509.6	5.5	0.0	0.0	1.5	1.4
				Intest.	625.6	19.6	0.0	0.0	14.9	0.0
				Liver	298.4	127.3	0.0	1.5	6.9	2.6
6	Bk	4	50-90	Wh. Fish	344.4	11.8	12.6	0.5	6.5	3.1
	Bn	2	90-100	Head	504.2	5.1	13.1	1.3	4.9	9.6
				Muscle	231.5	5.0	0.0	0.5	2.3	7.6
				Viscera	912.8	41.1	81.3	1.0	18.7	34.1

FIGURE 14 (CONTINUED)

Appendix C3. Climax Study Area 1971

Sta.	Spec.	No.	Size (mm)	Tissue	Tissue metal concentration (µg/g)					
					Zn	Cu	Pb	Ag	Cd	Mo
1	Bn	2	45-52	Wh. Fish	292.6	5.8	13.8	0.5	2.3	0.0
	Rb	12	50-70	Wh. Fish	423.7	10.2	14.8	1.0	2.7	0.0
3	Bk	2	62	Wh. Fish	154.5	3.4	0.0	0.5	0.0	0.0
	Bk	2	96-115	Head	339.7	3.7	7.5	1.5	2.6	0.0
				Viscera	393.4	7.7	21.7	0.0	2.9	0.0
				Muscle	147.2	3.5	0.0	0.3	0.0	0.0
	Bk	4	140-180	Gill	268.0	4.8	14.7	1.1	18.8	0.0
				Bone	488.4	5.3	26.9	1.9	12.1	0.0
				Eye	2123.5	3.7	0.0	0.0	0.0	0.0
				Skin	672.4	5.1	5.5	0.0	0.0	0.0
				Stomach	357.4	9.5	0.0	0.0	1.6	0.0
				Intest.	439.8	34.5	0.0	0.0	20.0*	0.0
				Liver	235.0	71.0	0.0	0.0	8.5	0.0
	Rb	2	220	Gill	269.8	3.4	9.0	1.0	1.3	9.4
				Bone	259.2	4.5	22.0	2.0	7.8	18.7
				Eye	661.4	2.3	0.0	0.0	0.0	0.0
				Skin	320.3	1.9	9.4	0.4	1.5	3.7
				Stomach	477.8	11.2	0.0	0.0	0.0	0.0
				Intest.	762.5	44.4	21.5	0.0	0.0	0.0
				Liver	404.0	825.2	0.0	1.2	2.1	0.0
5	Bn	6	145-215	Gill	256.9	4.4	5.5	0.9	2.4	1.6
				Bone	356.3	3.9	17.8	1.8	1.6	24.9
				Eye	1621.8	2.6	0.0	0.0	0.0	0.0
				Skin	323.1	4.0	9.5*	0.0	1.7	0.0
				Stomach	453.3	10.7	0.0	0.0	4.6	0.0
				Intest.	643.5	20.9	0.0	0.0	36.6	0.0
				Liver	279.7	133.4	0.0	0.6	7.0	0.0
6	Bk	6	160-225	Gill	312.8	5.7	5.2	0.9	9.6	4.4
				Bone	639.4	11.0	19.9	2.1	1.9	29.0
				Eye	2491.4	3.7	0.0	0.0	0.0	3.6*
				Skin	883.5	6.4	0.0	0.0	1.5	0.0
				Stomach	418.3	9.8	0.0	0.0	1.7	0.0*
				Intest.	487.2	61.5	0.0	0.0	6.3	9.8*
				Liver	243.5	106.7	0.0	0.6	7.1	2.0*

* Only one sample above detection limits.

FIGURE 14 (CONTINUED)

Appendix C4. Silverton Study Area 1969

Sta.	Spec.	No.	Size (mm)	Tissue	Tissue metal concentration (µg/g)					
					Zn	Cu	Pb	Ag	Cd	Mo
4	Bk	2	180-220	Gill	897.8	3.0	22.1	0.8	0.0	0.0
				Bone	2656.8	4.1	41.1	1.0	11.3	0.0
				Eye	107.4	9.7	0.0	0.0	5.7	0.0
				Skin	431.0	4.4	12.8	0.0	0.0	0.0
	Rb	7	200-300	Gill	829.7	5.4	18.3	0.7	2.3	0.0
				Bone	1857.9	5.7	33.1	2.3	19.9	0.0
				Eye	100.1	11.3	3.2	0.0	0.0	0.0
				Skin	194.6	6.0	13.2	0.1	0.0	0.0

Appendix C5. Silverton Study Area 1970

Sta.	Spec.	No.	Size (mm)	Tissue	Tissue metal concentration (µg/g)					
					Zn	Cu	Pb	Ag	Cd	Mo
2	Bk	4	155-240	Gill	416.7	27.1	27.2	0.5	10.6	0.0
				Bone	983.5	8.3	43.4	1.8	13.1	7.1
				Eye	1578.4	4.9	0.0	0.0	6.2	0.0
				Skin	734.7	9.7	19.1	0.0	1.7	0.0
				Stomach	629.0	34.1	1.8	0.0	5.8	2.9
				Intest.	302.4	111.0	4.4	0.0	12.2	0.0
				Liver	385.3	173.0	1.6	0.4	4.2	0.0
	Rb	7	170-240	Gill	529.4	18.1	33.7	1.0	8.4	7.5
				Bone	335.4	6.5	31.0	2.1	8.1	5.3
				Eye	709.5	4.4	0.0	0.0	0.0	0.0
				Skin	527.1	6.6	0.0	0.0	4.4	0.0
				Stomach	533.8	81.5	5.4	0.0	0.0	1.4
				Intest.	624.1	129.9	168.7*	0.2	3.0	0.0
				Liver	525.7	471.8	2.4	0.3	7.4	1.4

* Only one sample above detection limits.

FIGURE 14 (CONTINUED)

Appendix C6. Silverton Study Area 1971

			Size		Tissue metal concentration (µg/g)					
Sta.	Spec.	No.	(mm)	Tissue	Zn	Cu	Pb	Ag	Cd	Mo
2	Bk	2	120-130	Head	439.7	18.6	80.8	1.3	1.7	0.0
				Viscera	449.5	68.1	190.0	1.8	3.4	0.0
				Muscle	162.2	6.0	9.1	0.6	1.1	2.0
	Bk	2	160-180	Gill	351.3	8.7	54.5	0.7	0.0	6.8*
				Bone	677.7	6.8	21.3	2.0	2.8*	11.8*
				Eye	1633.6	3.3	0.0	0.0	0.0	0.0
				Skin	716.5	7.5	23.3	0.0	0.0	0.0
				Stomach	205.4	44.8	16.8	0.2*	0.0	0.0
				Intest.	291.7	70.3	93.6*	0.0	0.0	0.0
				Liver	247.9	190.1	0.0	0.8	0.0	0.0
	Rb	3	210	Gill		Sample lost in digestion				
				Bone	288.1	6.2	14.4	2.3	3.7	28.2
				Eye		Sample lost in digestion				
				Skin	296.3	8.9	5.7*	0.0	0.0	0.0
				Stomach	408.5	41.1	9.3	0.1*	2.7	0.0
				Intest.	608.2	125.2	85.4	0.0	0.0	0.0
				Liver		Sample lost in digestion				
3	Rb	5	240-280	Gill	208.5	5.3	8.8	1.1	0.0	0.0
				Bone	175.2	5.0	19.7	1.9	0.8*	34.1
				Eye	611.5	2.9	0.0	0.0	0.0	2.0*
				Skin	160.8	3.3	0.0	0.0	2.0	0.0
				Stomach	597.6	12.4	0.0	0.0	0.0	0.0
				Intest.	631.0	20.2	2.4*	0.9	2.7	0.0
				Liver	269.3	555.5	0.0	0.2	0.0	0.0
4	Rb	6	175-290	Gill	604.4	9.5	19.3	0.9	0.1*	5.6
				Bone	310.5	16.1	26.4	2.3	1.4	20.9
				Eye	668.1	6.6	0.0	0.0	0.2*	0.0
				Skin	741.7	26.3	1.6*	0.4	0.0	0.0
				Stomach	372.2	50.7	0.0	0.0	1.8*	0.0
				Intest.	352.7	54.9	7.5*	0.0	0.8*	0.0
				Liver	370.4	505.3	0.0	0.3*	0.8	0.0
5	Bk	2	130-160	Gill	475.1	24.8	21.0	0.0	5.4*	0.0
				Bone	807.5	8.4	32.1	2.4	5.2*	0.0
				Eye	1594.3	3.7	0.0	0.0	0.0	0.0
				Skin	946.4	9.1	0.0	0.0	0.0	0.0
				Stomach	470.4	87.9	0.0	0.0	0.0	0.0
				Intest.	493.0	111.2	0.0	0.0	0.0	0.0
				Liver		Sample lost in digestion				

* Only one sample above detection limits.

FIGURE 14 (CONTINUED)

Appendix C7. Lake City Study Area 1969

Sta.	Spec.	No.	Size (mm)	Tissue	Tissue metal concentration (µg/g)					
					Zn	Cu	Pb	Ag	Cd	Mo
3	Bn	2	150	Gill	160.9	5.9	9.0	1.1	5.4	0.0
				Bone	996.4	5.1	49.8	2.7	8.9	0.0
				Eye	56.5	9.4	0.0	0.0	0.0	0.0
				Skin	271.5	7.2	56.7	0.4	11.5	0.0
				Stomach	21.3	7.1	0.0	0.0	0.0	0.0
				Intest.	45.0	7.5	0.0	0.0	0.0	0.0
				Liver	18.8	8.0	0.0	2.3	0.0	0.0
4	Bn	2	80	Head	977.1	4.0	11.9	0.5	10.5	0.0
				Viscera	66.5	4.5	0.0	0.0	10.3	0.0
				Muscle	253.9	3.3	0.0	0.0	4.2	0.0

Appendix C8. Lake City Study Area 1971

Sta.	Spec.	No.	Size (mm)	Tissue	Tissue metal concentration (µg/g)					
					Zn	Cu	Pb	Ag	Cd	Mo
1	Bk	2	170-190	Gill	135.8	2.6	19.0	0.9	2.5	10.6
				Bone	142.3	3.8	28.5	1.9	0.0	14.2
				Eye	1000.6	2.0	0.0	0.0	0.0	0.0
				Skin	327.9	4.5	0.0	0.0	0.0	0.0
				Stomach	240.7	8.9	6.6	0.0	2.3	4.1
				Intest.	277.7	19.3	75.5*	0.9	0.0	0.0
				Liver	158.3	76.7	0.0	0.2	4.5	0.0
	Rb	2	220-250	Gill	374.5	5.4	25.5	0.7	4.7	0.0
				Bone	257.1	3.6	15.3	1.9	2.8	0.0
				Eye	799.2	2.1	6.9	0.0	1.0	30.4
				Skin	256.0	2.9	0.0	0.3	0.0	0.0
				Stomach	435.7	21.0	3.2	0.0	3.6	0.0
				Intest.	312.2	18.5	37.0	0.0	0.0	0.0
				Liver	289.2	409.9	0.0	0.0	2.6	0.0
2	Bn	7	140-225	Gill	496.6	4.0	11.2	0.6	5.3	0.0
				Bone	309.8	4.5	23.0	1.9	4.0	15.0
				Eye	1437.1	2.7	0.0	0.0	0.7	0.0
				Skin	341.0	4.0	3.3	0.5	0.9	0.0
				Stomach	524.2	35.6	5.8	0.0	2.5	0.0
				Intest.	670.5	48.9	10.4*	0.0	10.7	0.0
				Liver	417.9	569.4	3.7	1.0	12.1	0.0

* Only one sample above detection limits.

FIGURE 14 (CONTINUED)

Appendix C8. Lake City Study Area 1971 (continued)

			Size		Tissue metal concentration (ug/g)					
Sta.	Spec.	No.	(mm)	Tissue	Zn	Cu	Pb	Ag	Cd	Mo
3	Bn	7	55-80	Wh. Fish	271.4	4.9	4.5	0.6	0.0	3.3
	Bn	4	130-140	Head	399.3	3.2	15.2	1.3	0.5	14.3
				Viscera	422.0	42.1	0.0	0.0	0.0	0.0
				Muscle	137.5	3.1	4.9	0.5	0.0	5.4
	Bn	9	150-270	Gill	403.4	3.8	15.1	1.0	2.5	7.0
				Bone	222.9	18.9	18.6	1.9	1.8	16.4
				Eye	1271.8	3.0	0.0	0.1	0.2	0.0
				Skin	274.3	19.9	2.7	0.3	0.8	1.3*
				Stomach	627.1	11.9	0.0	0.0	0.0	0.0
				Intest.	1230.0	30.7	3.8*	0.2	0.9	0.0
				Liver	365.0	448.1	0.0	3.0	6.0	0.0
4	Bn	5	150-220	Gill	717.5	4.7	18.7	0.6	8.4	0.0
				Bone	438.4	4.7	29.4	1.9	1.6*	10.9
				Eye	1669.9	2.6	0.0	0.0	1.0*	0.0
				Skin	550.0	4.3	0.0	0.0	0.0	0.0
				Stomach	509.3	29.7	5.0*	0.0	1.9	0.0
				Intest.	832.9	47.5	189.4	0.2*	3.6*	0.0
				Liver	392.7	516.1	0.0	1.2	5.8	0.0

* Only one sample above detection limits.

FIGURE 14 (CONCLUDED)

Second, the waters sampled probably contained toxic metals in minute quantities which were not detected by the regular atomic absorption method.

The data shown in Figure 14 represents results from samples taken in 1969, 1970, and 1971. The fish were taken from six stations; represented three species of trout (rainbow, brook and brown); varied in size from 45 to 300 mm; and were from four different study areas. The reports have given the mean values for each tissue of lead and cadmium as well as others. These were derived by pooling the values of each tissue together and computing the mean. For example, the concentrations of lead and cadmium in gill tissue of six brook trout at station 1 with sizes of 50 to 90 mm were aggregated with values from three brown trout at station 4 with sizes 100-425 plus all the other values from Climax and the other study areas for 1969, 1970, and 1971.

These values are not, therefore, very meaningful in drawing inferences about specific species, or size or study areas. The researchers have admitted the inherent weakness of this approach, but said they proceeded that way because of the insufficiency of the accumulated data. This resulted from the small number of samples of each species which were taken, which was dictated by the desire to save hatcheries. That is, if larger samples were taken, some hatcheries would have been destroyed. In retrospect, wildlife officials felt that it would have been more meaningful to have larger samples even at the expense of liquidating some species. Furthermore, the data should show records of individual members of species. Instead of lumping the statistical characteristics of six brook trout together, the details of each one at each station would be more useful in elucidating trends of toxic metal accumulation in fish tissue. Another fault of the data is its dubious accuracy. The researchers have recently discovered that the modified Adrian method of tissue analysis which was being used will produce results which are reproducible among themselves in the tissues of that region, but might not necessarily compare well with studies in other regions.

The report asserts that the studies undertaken in 1973 would justify the establishment of water quality standards for trout waters for the heavy metals. This would follow from bioassay tests which showed maximum acceptable toxicant concentrations (MATC's) of four to eight μg/l for lead. A second potential outgrowth of the study would be valuable use of insects as indicators of heavy metal pollution especially in investigation of fish kills caused by heavy metals. However, no details are given of any data derived from chemical analyses of ambient insect tissue apart from that obtained from the bioassay conducted with stoneflies and mayflies.

1973 Study: The water quality data for the Williams Fork study area are being supplied by the Division of Wildlife to STORET. The significant point about toxic metal levels in these results is the detection of cadmium and lead in ranges of 0.01 to 0.55 mg/liter and 0.0 to 2.0 mg/l respectively. This finding is significant because the water was thought to be free of heavy metal pollution. The presence of these metals was detected by using a digestion method which was thought to be more sensitive to very small quantities of metals.

The insect tissue analyses show levels for zinc and copper, but no records are shown for cadmium and lead.

Fish tissues were analyzed from trouts collected from the Cache la Paudre River. Cadmium was found in tissues in ranges of 0.0 to 6.7 mg/l and lead ranged 0.0 to 27.8 mg/l.

Migratory Bird Investigation, Southeastern Colorado

The primary objective of this program was to identify non-hunting mortality factors of Canada geese at Turks Pond. It was also designed to determine if lead poisoning occurs in the waterfowl population at the pond and within its vicinity.

Samples of dead and live Canada geese having no external or visible signs of gunshot wounds were collected on 5, 11, and 21 February and 5 March 1974 in the vicinity of Turk's Pond. An attempt was made to capture at least ten live birds on each collection date. Live birds were captured by hand or with the use of a net, and their selection was based almost solely on the ease of capture. No specific sampling scheme was used in the collect of dead birds. Birds were transported on the day of collection to Fort Collins Wildlife Research Center. Live birds were killed and necropsied within two days of collection. Tissue from a portion of the liver,, a kidney, breast muscle, and the radius bone were taken from each goose for lead determination.

Lead levels of organs and tissues taken from 90 Canada geese collected at Turk's Pond and from ten pen-reared control birds are presented in Figure 15. The data shows that the liver of 89 birds were sampled and yielded a mean of 90.73 ppm; the kidney from 83 birds was tested and gave 120.25 ppm; the msucle of 68 geese yielded 63.35 ppm; and the radius bone of 69 yielded 53.35 ppm of lead.

The controlled birds yielded 5.4, 4.6, 3.0 and 4.1 ppm lead for liver, kidney, muscle and bone, respectively. These results show that the birds had ingested lead pellets which might have been responsible

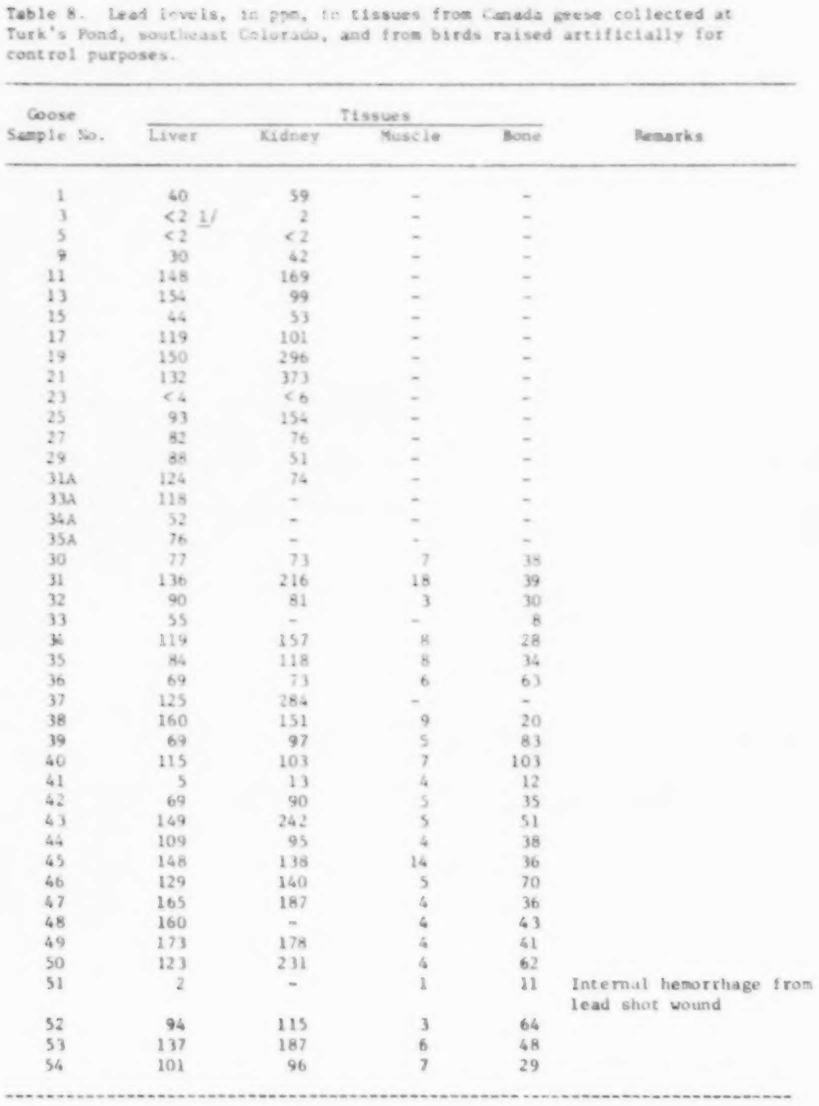


Table 8. Lead levels, in ppm, in tissues from Canada geese collected at Turk's Pond, southeast Colorado, and from birds raised artificially for control purposes.

Goose Sample No.	Tissues				Remarks
	Liver	Kidney	Muscle	Bone	
1	40	59	-	-	
3	<2 1/	2	-	-	
5	<2	<2	-	-	
9	30	42	-	-	
11	148	169	-	-	
13	154	99	-	-	
15	44	53	-	-	
17	119	101	-	-	
19	150	296	-	-	
21	132	373	-	-	
23	<4	<6	-	-	
25	93	154	-	-	
27	82	76	-	-	
29	88	51	-	-	
31A	124	74	-	-	
33A	118	-	-	-	
34A	52	-	-	-	
35A	76	-	-	-	
30	77	73	7	38	
31	136	216	18	39	
32	90	81	3	30	
33	55	-	-	8	
34	119	157	8	28	
35	84	118	8	34	
36	69	73	6	63	
37	125	284	-	-	
38	160	151	9	20	
39	69	97	5	83	
40	115	103	7	103	
41	5	13	4	12	
42	69	90	5	35	
43	149	242	5	51	
44	109	95	4	38	
45	148	138	14	36	
46	129	140	5	70	
47	165	187	4	36	
48	160	-	4	43	
49	173	178	4	41	
50	123	231	4	62	
51	2	-	1	11	Internal hemorrhage from lead shot wound
52	94	115	3	64	
53	137	187	6	48	
54	101	96	7	29	

FIGURE 15
LEAD LEVELS IN CANADIAN GEESE IN COLORADO

Table 8. Lead levels, in ppm, in tissues from Canada geese collected at Turk's Pond, southeast Colorado, and from birds raised artificially for control purposes.(continued).

Goose	Tissues				
Sample No.	Liver	Kidney	Muscle	Bone	Remarks
55	138	148	8	35	
56	82	107	6	238	
57	80	-	1,738	31	
58	104	120	14	49	
59	76	56	38	-	
60	104	104	-	76	
61	247	629	5	28	
63	87	56	4	29	
64	126	88	3	60	
65	57	39	9	26	
66	105	144	3	106	
67	8	6	2	13	Collected as a normal appearing cripple
68	97	108	7	38	
69	80	73	7	37	
70	125	143	4	48	
71	100	114	4	-	
72	130	128	4	59	
73	50	77	4	34	
74	54	77	5	31	
75	75	96	10	47	
76	52	48	15	37	
77	93	93	7	446	
78	79	128	12	31	
79	160	196	8	35	
80	170	151	19	59	
82	51	105	5	44	
83	53	67	5	33	
84	67	114	3	37	
85	122	109	2,137	131	
86	-	68	4	29	
87	76	86	7	67	
88	182	199	8	59	
89	44	243	2	60	
90	94	151	5	108	
91	108	87	2	39	
92	116	295	7	76	
93	283	461	9	43	
94	106	76	6	74	
95	62	40	6	79	
96	3	5	3	13	Collected as a normal appearing cripple
97	5	6	2	26	
98	79	104	2	40	
99	81	110	6	32	
100	3	12	2	14	Collected as a normal appearing cripple
101	2	3	2	2	Collected as a normal appearing cripple

FIGURE 15 (CONTINUED)

Table 8. Lead levels, in ppm, in tissues from Canada geese collected at Turk's Pond, southeast Colorado, and from birds raised artificially for control purposes (continued).

Goose Sample No.	Tissues				Remarks
	Liver	Kidney	Muscle	Bone	
102	10	69	2	17	
103	66	48	6	23	
C1	12	11	2	6	Control
C2	4	5	5	10	Control
C3	2	4	4	8	Control
C4	2	2	4	8	Control
C5	4	[illegible]	3	-	Control
C6	20	11	3	-	Control
C7	4	-	3	-	Control
C8	2	6	2	-	Control
C9	2	-	2	-	Control
C10	2	5	2	9	Control

1/ Less than signs (<) are a function of weight of the sample.

FIGURE 15 (CONCLUDED)

for some of the deaths, and also that lead had accumulated in the tissues to as much as 2,137 ppm which was recorded for the muscle tissue of one bird. It is not clear what diet the control birds were fed or where they were obtained, but their tissues show a much lower level of lead than the birds sampled from the study area.

Conclusions

Birds are ingesting lead pellets which are distributed on agricultural lands around Turks Pond, and these seem to be the result of hunters shooting from the firing line. There is evidence to suggest that the ingestion of a single lead pellet may be sufficient to cause lead poisoning in geese associated with Turks Pond. As a result of these conclusions, according to Wildlife Division officials, hunting regulations were recently changed to require use of steel shot in the Turks Pond area.

General Conclusions on Wildlife Division Data

From an environmental monitoring viewpoint, the most useful data gathered by the Colorado Division of Wildlife was the routine water quality sampling for lead and cadmium in the study areas for the past several years. As noted, this data has been reported to the STORET system and is available for analysis through EPA channels. The bioassay studies of laboratory controlled specimens, while useful in determining levels at which toxicants are harmful to wildlife, do not in themselves provide information on toxic substances in the Colorado environment. Finally, the data on lead and cadmium in fish, insects, and geese tissues served mainly to demonstrate that the tissue does concentrate those toxic substances from the environment. There was no successive sampling from the same sites of sufficient number of the same type of samples to allow very useful summary or analysis of environmental trends. Because each data value, as seen in the tables of Figures 14 and 15, is virtually unique, no better way was found to record the data than the forms received from the Wildlife Division. Similarly, no reasonable way was found to summarize such diverse data other than what has been presented in the above discussion.

Department of Health and Hospitals, City and County of Denver

The Department operates six sampling stations on the South Platte River. Twenty-three parameters are monitored for water quality, of which arsenic, cadmium and lead are the only ones which are pertinent to this project. Samples are taken once per year. The resulting data is not reported to STORET. There is also monitoring on Cherry Creek, but no parameters of interest are determined.

The data supplied has six values for each of the metals mentioned above per year. There are data for three years, 1971-1973, so there are 54 values. The values recorded for 1971 are all zero for all three metals at all six stations. Those for 1972 show an identical pattern except for lead, which has a recorded value of 0.01 at the Franklin sampling station. For 1973, there are zero values for arsenic and cadmium at all stations, but there are three significant values recorded for lead. There are levels of 40, 50, and 85 mg/l at Dartmouth, Alameda and Franklin stations respectively. There is no explanation accompanying the data to account for the large values of lead recorded at those three stations.

Figure 16 shows a data sheet as received from the Denver agency. The water quality data for the three metals has been transformed by MITRE into the form which the Colorado Department of Health uses to report data to STORET (see Figure 17).

Since all except four of the values were zero, statistical analysis was not considered appropriate for the Denver City/County data.

CHEMICAL ANALYSIS OF SAMPLING STATIONS

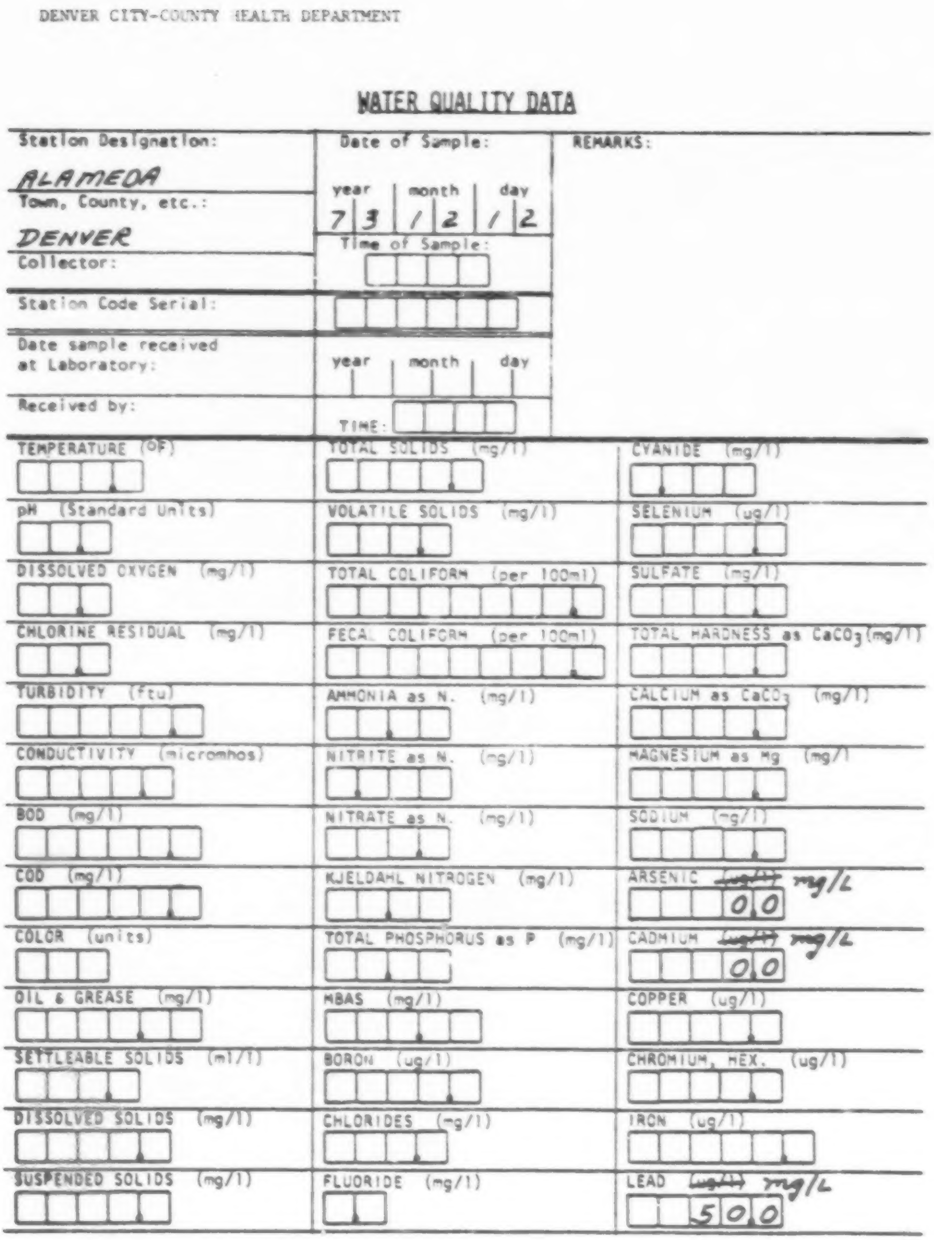
SOUTH PLATTE RIVER

(November 9, 1971)

	Bowles	Dartmouth	Alameda	Cherry Cr.	19th St.	Franklin
Turbidity (Units)	44	49	33	11	84	63
Arsenic	0	0	0	0	0	0
Cadmium	0	0	0	0	0	0
Chromium +6	0	0	0	0	0	0
Fluoride	1.2	0.9	1.0	0.8	1.2	1.0
Lead	0	0	0	0	0	0
Selenium	0	0	0	0	0	0
Total Hardness	184	267	267	290	270	290
Calcium	149	227	204	239	212	223
Magnesium	9	10	15	12	14	16
Total Solids	321	488	470	538	550	604
Sodium	39	66	64	69	80	89
MBA Surfactants	0	0	0	0	0	0.08
Copper	0	0	0	0	0	0.13
Zinc	0	0	0	0	0	0
Iron	.05	0.15	0.12	.05	0.25	0.25
Manganese	.05	0.1	0.3	0	0.6	0.6
Chloride	41	56	54	74	64	72
Nitrate	5	0	6.5	6.3	5.3	1.5
Sulphate	95	137	140	136	162	171
Phosphate	0.1	1.0	2.6	1.4	2.4	2.1
Ammonia	0	0.05	2.1	0.05	4.0	4.0
Boron	0	0.1	0.06	0.1	0.45	0.36

All analysis in mg/l unless indicated.

FIGURE 16
WATER QUALITY DATA SHEET RECEIVED
FROM DENVER CITY-COUNTY



DENVER CITY-COUNTY HEALTH DEPARTMENT

WATER QUALITY DATA

Station Designation: ALAMEDA
Town, County, etc.: DENVER
Collector:
Date of Sample: year 73 month 12 day 12
Time of Sample:
REMARKS:
Station Code Serial:
Date sample received at Laboratory: year month day
Received by:
TIME:

TEMPERATURE (°F)	TOTAL SOLIDS (mg/l)	CYANIDE (mg/l)
pH (Standard Units)	VOLATILE SOLIDS (mg/l)	SELENIUM (ug/l)
DISSOLVED OXYGEN (mg/l)	TOTAL COLIFORM (per 100ml)	SULFATE (mg/l)
CHLORINE RESIDUAL (mg/l)	FECAL COLIFORM (per 100ml)	TOTAL HARDNESS as $CaCO_3$ (mg/l)
TURBIDITY (ftu)	AMMONIA as N. (mg/l)	CALCIUM as $CaCO_3$ (mg/l)
CONDUCTIVITY (micromhos)	NITRITE as N. (mg/l)	MAGNESIUM as Mg (mg/l)
BOD (mg/l)	NITRATE as N. (mg/l)	SODIUM (mg/l)
COD (mg/l)	KJELDAHL NITROGEN (mg/l)	ARSENIC ~~(ug/l)~~ mg/L 0.0
COLOR (units)	TOTAL PHOSPHORUS as P (mg/l)	CADMIUM ~~(ug/l)~~ mg/L 0.0
OIL & GREASE (mg/l)	MBAS (mg/l)	COPPER (ug/l)
SETTLEABLE SOLIDS (ml/l)	BORON (ug/l)	CHROMIUM, HEX. (ug/l)
DISSOLVED SOLIDS (mg/l)	CHLORIDES (mg/l)	IRON (ug/l)
SUSPENDED SOLIDS (mg/l)	FLUORIDE (mg/l)	LEAD ~~(ug/l)~~ mg/L 50.0

FIGURE 17
FORM USED BY MITRE TO RECORD DENVER DATA

SECOND QUARTER

DATA SUMMARY AND ANALYSIS

Processing and Analysis of Data Resulting From Contacts with the States

The bulk of data processed and analyzed in this reporting period, after the Pennsylvania air data was completed, was that which was obtained as a result of meetings with agencies in the state of Massachusetts. The Massachusetts data was mainly from samples originating with a number of different agencies and analyzed at the Massachusetts Department of Public Health, Lawrence Experiment Station. This data included several thousand values for a varying number of toxic substances found in fish and shellfish tissue, sediment, river water, public water supplies, sludge, bottled water, harbor bottoms and saltwater samples. The first data from Missouri agencies was not received at MITRE until 20 December 1974; some New York and New Jersey Data was also received during the third quarter. Consequently, only the processing and analysis of the Massachusetts toxic substances data will be reported in this section for the second quarter. The Missouri data, some of the New York and New Jersey data, and as much of the data from Washington, Texas, Georgia, Michigan and California as was received will be discussed in the third quarter section.

Massachusetts Data Analysis

Data was reviewed from three agencies in Massachusetts. Below is a listing of the agencies and the data obtained:

1. Massachusetts Water Resources Commission, Division of Water Pollution Control.
    - (a) An Investigation of Mercury Problems in Massachusetts
    - (b) Trace Metal Analysis of Boston Harbor Water and Sediments
    - (c) The Ten Mile River
    - (d) Wastewater Discharge Survey, Connecticut River Basin
2. Massachusetts Division of Fisheries and Game
    - (a) Analysis of Fish Tissue for Mercury, July 1970 - March 1971
    - (b) Analysis of Fish Tissue for Mercury, April 1971 - March 1972
    - (c) Pesticide Monitoring Program, April 1970 - March 1971
    - (d) Presence of PCB in Housatonic River
    - (e) Pesticide Program, April 1972 - March 1973
3. Massachusetts Department of Natural Resources and Department of Public Health.
    - (a) Toxic Substances Survey
    - (b) Interstate Carrier Water Supply
    - (c) Bottled Water Program

The analysis and discussion are given in the pages that follow.

1.0 MASSACHUSETTS WATER RESOURCES COMMISSION, DIVISION OF WATER POLLUTION CONTROL

(a) An Investigation of Mercury Problems in Massachusetts

An investigation of mercury problems in Massachusetts was undertaken by a contractor for the Division of Water Pollution Control. The investigation was divided into several surveys, and each will be discussed separately.

Ashland Area--Sudbury River Program

The major source of mercury pollution in the Ashland area has been the Nyanza Chemical Corporation. The metal was used by this corporation at the rate of 5,000 lbs per year. However, its use was discontinued in November 1972. Prior to 1970, the mercury wastes entered the Sudbury River by way of a small brook on the Nyanza property. Since that time, the mercury content of wastes was considerably reduced from about 7.5 ppm, as the wastes entered the lagoons, to 100 ppb in 1971. It was estimated that over the 30-year period (1940-1970), over 100,000 lbs. of mercury was carried by surface water in the brook to the Sudbury River system. It is further estimated that an additional 25,000-35,000 lbs is presently contained in sludges deposited on Nyanza property. Ground water contamination has been linked to this disposal.

The Ashland area was divided into six sections:

Area No. 1

This area lies northwest of the Nyanza plant facilities and consists of approximately 93,000 square feet close to the plant.

The area is essentially a wetland for about two-thirds of the year. The area was completely drained in the summer of 1972, but reverted to the wetland condition by the spring of 1973 as a result of runoff and the high water table. The floor of the area is covered with 6-18 inches of sludge-like material. Core samples were taken and analyzed for mercury content.

The results of analyses performed on 14 samples are shown in Figure 18. The samples were divided into three sections, 0-3 inches, 3-6 inches, and 6-9 inches. The data indicates an area rich in mercury with an estimated concentration 1500 ppm per cubic foot of dry material. On that basis, it was caluclated that there are approximatley 12,600 lbs. of mercury in the area. There is a grave concern over contamination of ground water, for the area is thought to be a recharge zone for the nearby aquifer. Studies performed on ground water have confirmed that it is contaminated with mercury.

Area No. 2

This is a wooded hillside area south of Area 1. The ground is covered with a sludge and organic material between four and five inches deep. Sampling in this area was limited.

No data is shown, but the report states that the average mercury concentration in the sludge for a six inch core is about 300 ppm dry weight. The total quantity of mercury is estimated to be about 1,365 lbs.

Sample No.	Core Layer (in)	Total Hg (Dry Wt., ppm)
17	0-3	486
	3-6	282
18	0-3	747
	3-6	442
	6-9	219
19	0-3	1687
	3-6	2837
	6-9	3051
20	0-3	4141
	3-6	4795
	6-9	1423
21	0-3	4985
	3-6	3521
	6-9	1851
22	0-3	1395
	3-6	758
	6-9	4177
23	0-3	1038
	3-6	1598
	6-9	325
24	0-3	329
	3-6	597
	6-9	443
25	0-3	1494
	3-6	555
	6-9	1399
26	0-3	1106
	3-6	521
	6-9	589
27	0-3	1220
	3-6	400
	6-9	480
28	0-3	784
	3-6	57
	6-9	16.5
29	0-3	505
	3-6	289
30	0-3	380
	3-6	396
	6-9	548

FIGURE 18
MERCURY LEVELS IN SEDIMENTS

Area No. 3

This is a disposal area located on an excavated flat area on a hill southwest of the plant. It is at an elevation of 100 feet above the plant and the adjacent wet areas. About one-half of the area was filled and covered prior to the sampling program, hence, the estimates of mercury would be somewhat inconclusive. Samples were taken near the edge of the disposal area, where the sludge deposits have not been covered and are about two to three feet deep.

No data are shown for the Area 3 survey. It was reported that the average mercury concentration in the top foot was 400 ppm. It was subsequently estimated that there was about 6,480 lbs of mercury in this section.

Area No. 4

This area lies to the southeast of the plant on a hill between an old railroad bed and disposal site (Area No. 3). A drainage course winds down the hill to a small brook which flows parallel to the railroad bed. An old spring is located on the side of the disposal site. The spring has a good flow and seems to be a part of a perched water table. Analyses for mercury were done on water samples from the brook and spring. During 1972, there was an overflow of sludge from the disposal area after heavy rainfall. The sludge was washed down the drainage course, some of which is still visible in large quantities. Nine core samples were taken from the affected drainage area, which represents about 80,000 square feet of the total area of 312,000 square feet.

One mercury analysis of the spring water indicated a concentration of 8.6 ppb, while an analysis of water in the brook indicated a mercury level of 57 ppm.

Mercury has been found in sediments located 100 feet or more from the drainage course. The greatest levels occur near the bottom of the hill with levels in the upper two inches of sediments being as high as 3337 ppm of mercury (Figure 19). It was discovered that mercury was contained primarily in the upper eight inches of the sediment. Estimates of mercury in the area were put at 1,080 lbs.

Area No. 5

This area includes the beginning of the brook where Nyanza's effluent was piped prior to 1970. About 30,000 square feet of the total 104,000 square feet is a pond. Sediment samples were taken along the brook and in the pond.

The concentration of mercury in the samples from the pond was reported to be 1000 to 1500 ppm, while samples from the side of the brook ranged from 300-500 ppm mercury. It was estimated that the sediments contained a mercury concentration of 1250 ppm in the top one foot over a 30,000 square foot area, a 400 ppm concentration in a 20,000 square foot area, and a 300 ppm concentration in a 107,000 square foot wet area near the administration

Sample No.	Core Layer (in)	Total Hg (Dry Wt., ppm)
31	0-3	897
	3-6	672
	6-9	119
32	0-3	403
	3-6	654
	6-9	235
33	0-3	59.5
	3-6	4.96
	6-9	9.09
34	0-3	473
	3-6	19.0
	6-9	7.83
35	0-3	102
	3-6	43.6
	6-9	13.8
36	0-3	1242
	3-6	45.3
	6-9	3.24
37	0-3	3337
	3-6	1499
	6-9	1189
38	0-3	838
	3-6	509
	6-9	142
40	0-3	70.0
	3-6	50.8
	6-9	3.37
39a (water sample)		57 (ppb)
spring water sample		8.6 (ppb)

FIGURE 19
MERCURY LEVELS IN SEDIMENTS

building. This would yield an estimated total quantity of 4,365 of mercury.

Area No. 6

This area is located out the main entrance of Nyanza to the west of the brook. The past history of the area suggested that it was a disposal site from which much of the mercury was released by erosive forces. Monitoring for mercury concentration began in early 1972. Sixteen core samples were taken in this area for mercury analysis.

The results are shown in Figure 20. The pattern indicated that samples with the high values are from the perimeter of the area, while those with low values are from the central or gully regions. It was observed that there is a relative absence of organic material in the gully sections. Organic material seems to have a high binding affinity for mercury. Further, the absence of organic material or vegetation exposes the soil to erosive forces during moderate to heavy rainfall.

The concentrations of mercury in the sediments on the east bank of the brook are quite high. Number 4 core sample from this area was examined for the presence of methyl mercury. The total mercury of the composite sample from the core had dry weight concentration of 229 ppm. The methyl mercury extraction indicated 502 ppb giving a methyl mercury fraction of 0.22 percent of the total mercury.

Sample No.	Core Layer (in)	Total Hg (Dry Wt., ppm)
1	0-3	1306
	3-6	831
	6-9	505
2	0-3	42.4
	3-6	1.90
	6-9	2.30
3	0-3	11.0
	3-6	3.09
	6-9	0.469
4	0-3	387
	3-6	224
	6-9	78.3
5	0-3	2.03
	3-6	2.76
	6-9	2.29
6	0-3	1.18
	3-6	1.68
	6-9	1.81
7	0-3	71.8
	3-6	9.35
	6-9	11.34
8	0-3	410.1
	3-6	165.4
	6-9	39.2
9	0-3	65.9
	3-6	4.93
	6-9	7.43
10	0-3	11.9
	3-6	4.55
	6-9	4.20
11	0-3	9.54
	3-6	4.03
	6-9	2.37
12	0-3	129
	3-6	29.6
	6-9	2.16

FIGURE 20
MERCURY LEVELS IN SEDIMENTS

Sample No.	Core Layer (in)	Total Hg (Dry Wt., ppm)
13	0-3	28.0
	3-6	21.4
	6-9	2.75
14	0-3	6.36
	3-6	1.16
	6-9	2.22
15	0-3	7.51
	3-6	0.56
	6-9	0.73
16	0-3	35.6
	3-6	38.3
	6-9	21.0

FIGURE 20 (CONTINUED)

Since the brook carried large amounts of mercury during the past three decades, it was not surprising to find high concentrations of mercury in the soils adjacent to it. It was interesting to note that methyl mercury constituted a relatively low percentage of the total. It has been suggested that the process of methylation could result in the release of some mercury to the atmosphere. It is also possible that an equilibrium is established between methylating and demethylating bacteria.

Groundwater Contamination

In view of the history of sludge disposal difficulties around the Nyanza plant, a preliminary investigation of groundwater contamination was undertaken. The major area of concern was Area No. 1, which was the low area adjacent to the railroad tracks near the General Electric plant (No. 2). There was also concern of possible ground water contamination near the sludge settling ponds and near the brook course at the eastern edge of Nyanza property.

Four test wells were sunk in the vicinity of the above areas and well samples were analyzed for both total and dissolved mercury. The well samples were obtained for various pumping times in order to determine the influence of ground water draw-down on the mercury concentrations. Shallow soil borings were also made at four locations in Area No. 1. The purpose of the borings was to determine the elevation of standing ground water in the holes and to investigate the soil types. There was also interest in determining the significance of this area as an aquifer recharge zone.

The results of the analyses on well samples are tabulated in Figure 21. In almost every case, the mercury levels greatly exceed the U. S. Public Health guideline of 5 ppb maximum total mercury. The effect of pumping time on each well was examined. For the shallow well No. 1, the levels in almost every case decreased with increased pumping time, This was particularly noticeable on November 17, 1972, when rainfall was three to four inches above normal for the month. It seems that in this case with the increased pumping, the well drew down water from near the surface. This water would not be contaminated (at that time) and would tend to dilute the mercury contaminated ground water drawn in from the direction of Area No. 1.

In the case of the deep section of well No. 1, the levels tend to increase with increased pumping. (This pattern held for every case except September 22, 1972.) This pattern would suggest that the ground water in the near vicinity of the well is diluted by water percolating down from ground level and as the well is pumped, the draw down brings in the contaminated water from Area No. 1. This gives support to the belief that Area No. 1 acts as a recharge for aquifer.

	Well #1 Shallow (G. E.)		Well #1 Deep (G. E.)		Well #2 Admin. Bldg.		Well #3 Parking Lot	
	T	D	T	D	T	D	T	D
Sept. 7, 1972 Standing Water	30.2	19.9	50.7	37.7	20.3	12.5	17.2	9.1
Sept. 22, 1972								
Pumping 1 min.	148	118	260	200	59	41	-	191
10 min.	52	36	4220	3300	35.2	28	83	16.9
20 min.	46	37	174	134	40	27	23.7	16.4
Oct. 4, 1972								
Pumping 1 min.	38	25	48	47	41	34	36	29
10 min.	34	32	112	112	54	51.2	33	26
20 min.	38	23.5	119	116	54	42	40	15.4
Oct. 20, 1972								
Pumping 1 min.	42	29	58	46	21.5	6.4	24	11.2
10 min.	32	23	118	114	43	29	34	22
Nov. 17, 1972*								
Pumping 1 min.	35	16.9	46	35	13.8	0.8	16.3	4.0
10 min.	9.7	5.9	84	80	17.6	5.4	4.4	3.9
April 24, 1973 Pumping 1-10 min.	23.5	13	184	27	12.0	11.0	19.0	4.0

*Rainfall 3-5" above normal this period. High groundwater levels. Note dilution effect in shallow wells.

FIGURE 21
EFFECTS OF PUMPING ON TEST WELLS

The mercury levels in pumped water samples from wells No. 2 and No. 3 are somewhat erratic and no specific conclusion was therefore drawn.

The results clearly indicate that mercury levels are influenced by high rainfall and runoff. The November 1972 results are quite low compared to the October results. November rainfall was three to five inches above normal for the Boston area.

Two of the soil borings (C_1 and C_3) contained a high percentage of silty-sand which is semi-permeable and allows water seepage. Water levels in test holes were within one foot of the surface.

One of the other two samples (C_2) was a peat-organic material mixed with large cobbles. The other (C_4) had some organic material mixed with silt and sand. The total mercury content of C_2 (peat-organic) was 3538 ppm. This is a very high concentration, but is consistent with the high affinity which these soils have for mercury. Mercury levels in samples C_1, C_3, and C_4 were 62, 26 and 22 ppm respectively. The soil sampling further substantiates the earlier belief that the site is a recharge area for the sand and gravel aquifer which runs parallel to the Sudbury River which drains the aquifer during periods of low flow.

Surface Water Monitoring

In order to determine how much mercury is entering the reservoir as a function of surface runoff, a series of monitoring stations were set up between the Nyanza plant and Framingham Reservoir No. 2. Each station was sampled at a frequency of approximately twice monthly from the end of March 1972, until the end of November 1972. This period covered the spring runoff, heavy rainfall during June, a dry month of August, and heavy rainfalls in late October and November.

The samples were collected in plastic sampling bottles and were immediately acidified to pH 1 with the exception that samples to be analyzed for dissolved mercury were filtered with 0.45 micro millipore filter apparatus prior to acidification with nitric acid.

Data from the analyses is tabulated in Figure 22, and the results for total and dissolved mercury for three of the stations are illustrated graphically in Figures 23 and 24. The results in Figures 23 and 24 show two definite peaks in the mercury concentration of the surface waters. The Megunko Road station (Station 1) on the brook is very high in late June and again in late October. The rainfall records do not support the idea of attributing peaks to periods of unusually high rainfall which would induce erosion. More directly, the peak in June has been linked to the overflow of sludge from a lagoon situated on a hill. The cause of the peak in October was not ascertained, but was not thought to be related to runoff and could result from displaced sludge from the lagoon during filling operations.

	Nyanza Brook Megunko Street		Area #6 Leachate at RR		Nyanza Brook at RR		Brook at Cherry Street		Brook Above Junction w/Sud R		Sudbury R Below Junction w/Brook		Reservoir #2 at Union St. Bridge		RR Bridge		Remarks
	T	D	T	D	T	D	T	D	T	D	T	D	T	D	T	D	
3/31/72	28	26	320	28	13	12	16	10	7	5.6	15	15	28	21			Sudbury R swollen with spring runoff. Over normal banks.
4/21/72	9.6	5.9	83	41	-	-	12	6.8	-	-	9	5	-	-			
5/5/72	18	13	47	4.4	8.5	7.2	7.9	3.8	5.5	3.5	-	4.9	0.9	0.7			
5/16/72	27	7.2	46	11	17	6.3	6.7		10	4.7	2.8	1.5	4.3	1.7			
6/5/72	63	27	125	14	20	8.7	17	7.2	9.4	4.5		2.7		2.6			
6/21/72	118	76	122	18	35	21	36	21	23	19	21	20	17	17			Very heavy rains on Mon. and Tues. preceding sampling
7/20/72	7.9	5.5	23	9.7	27	11	20	9.7	19	6.6	5.2	0.2	5.6	3.0			Samples taken from ditch used to drain collection area at base of hill. T = 172, D = 84
8/14/72	9.8	6.7	(dry)		12	6.7	2.8	2.1	7.3	0.2	3.8	1.6	8.2	3.6			
8/29/72	15	7.8	-		11	7.4	4.0	2.7	2.9	2.6	1.3	1.3	9.0	2.7	11	6.2	
9/7/72	18	6.6	-		11	9.0	21	2.8	0.9	0.7	1.6	1.0	1.9	0.2	5.9	2.7	
9/20/72	35	15	51	22	64	41	10	4.4	8.1	2.3	7.5	6.8	2.6	1.8	3.7	1.2	Heavy rain on Tues.

FIGURE 22
BROOK AND RIVER MONITORING DATA (TOTAL AND DISSOLVED Hg, ppb)

	Nyanza Brook Megunko Street		Area #6 Leachate at RR		Nyanza Brook at RR		Brook at Cherry Street		Brook Above Junction w/Sud R		Sudbury R Below Junction w/Brook		Reservoir #2 at Union St. Bridge		RR Bridge		Remarks
	T	D	T	D	T	D	T	D	T	D	T	D	T	D	T	D	
10/4/72	21	15	-		15	10	14	14	15	8.7	10	6.1	9.2	8.7			
10/20/72	58	45	-		50	49	23	19	-		-		17	16	14	13	
11/17/72	8.1	7.3	12	6.8	17	5.1	11	4.9	-		-		5.0	2.8	4.6	4.4	

FIGURE 22 (CONTINUED)

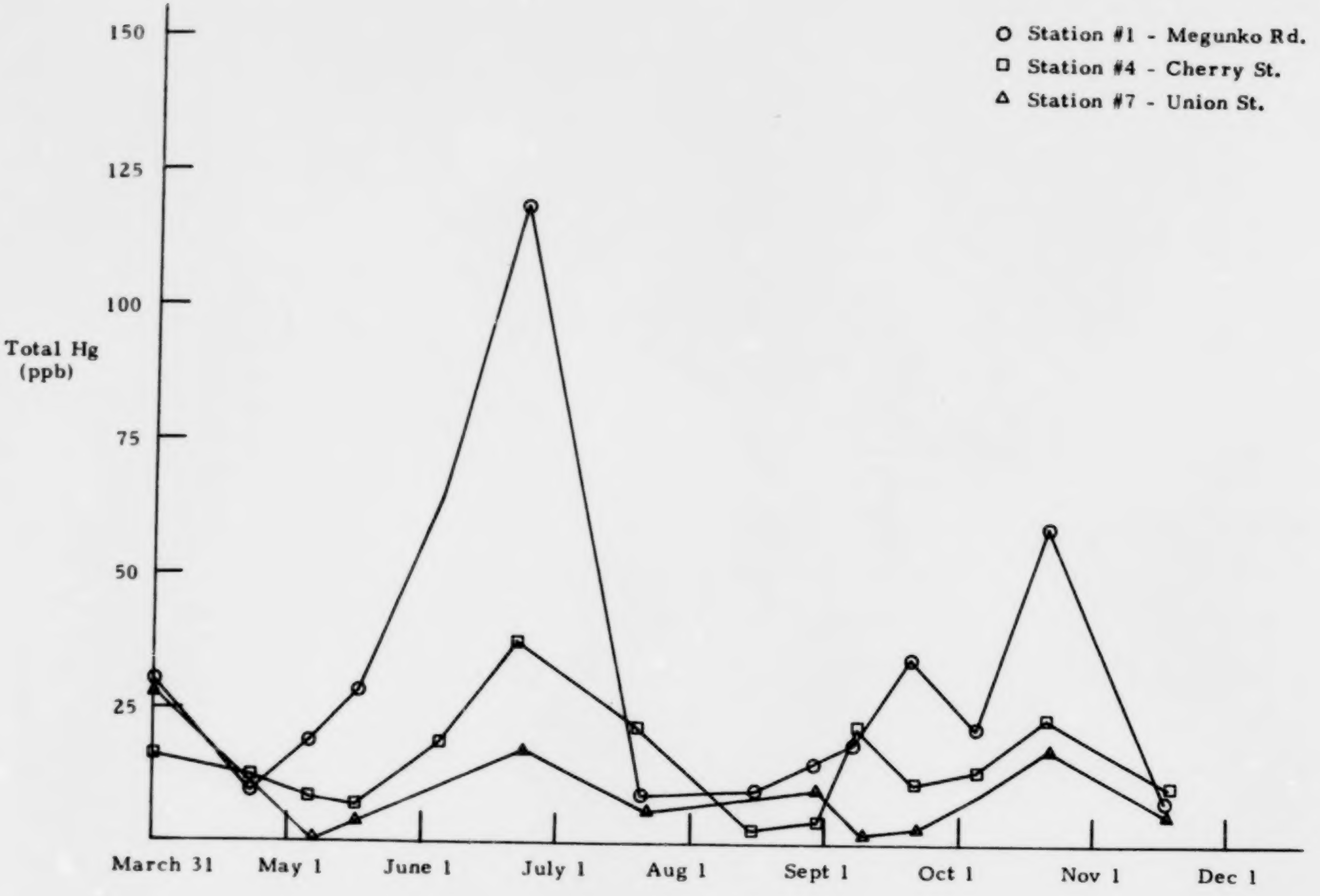


FIGURE 23
TOTAL MERCURY AT MONITORING STATIONS

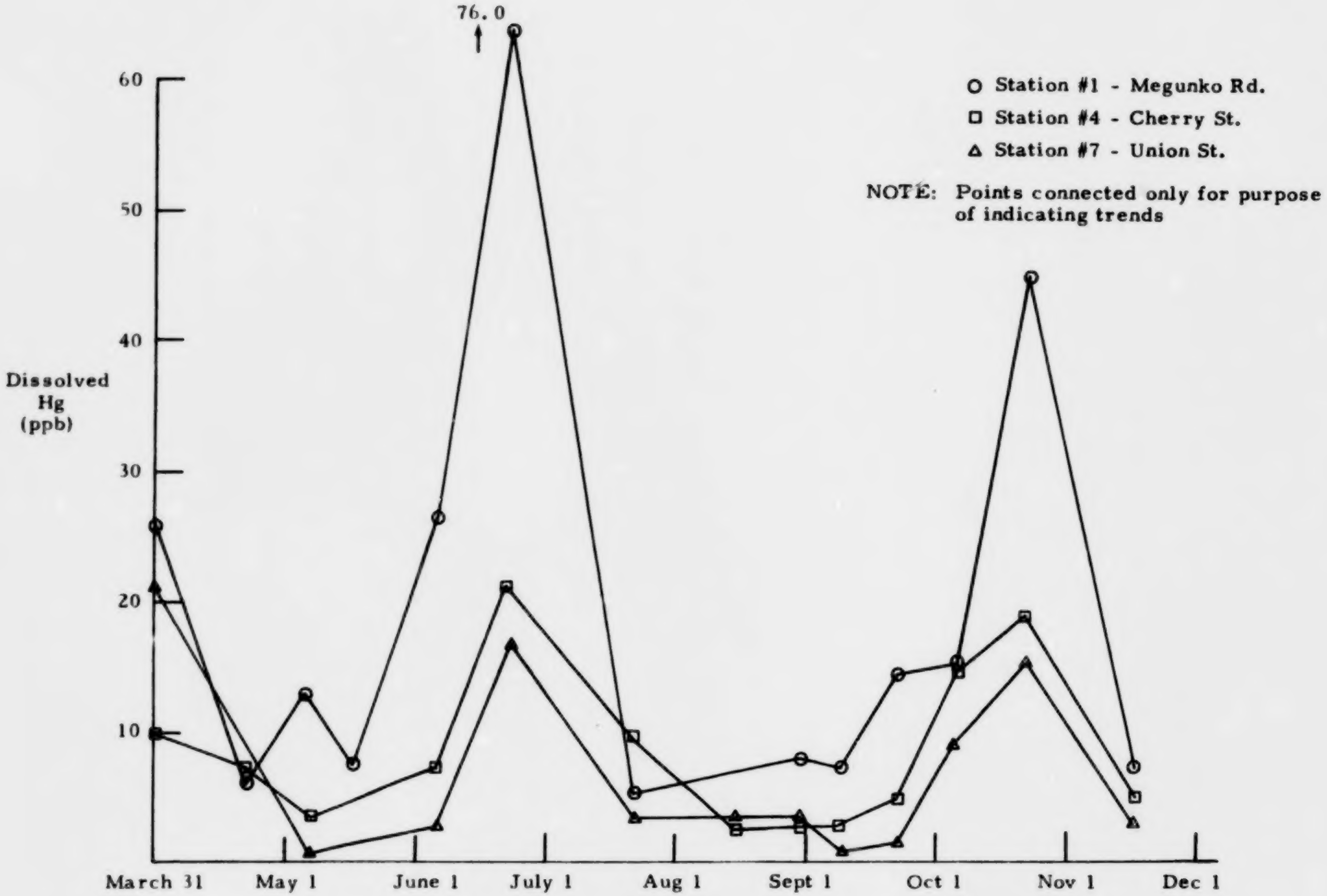


FIGURE 24
DISSOLVED MERCURY AT MONITORING STATIONS

Taunton River and Muddy Cove Survey

A field survey of the Taunton River was conducted on August 24, and September 15, 1972. The purpose of the survey was to determine through grab sampling the distribution of mercury in bottom sediments above and below the ICI America* Dighton plant; also, to determine if any other significant sources of mercury contamination could be identified.

Samples were collected and stored in plastic sample bottles for later analysis. The analyses were performed for total mercury. Percent moisture was also determined and the mercury concentration was reported on a dry weight basis.

Muddy Cove, a small inlet on the Taunton River, is bounded by a hurricane gate which blocks passage of tidal waters beyond that point. The ICI America plant is located west of Muddy Cove adjacent to Muddy Brook lagoon. The lagoon is isolated from tidal influx, but does overflow into Muddy Cove. The effluent from ICI enters the lagoon. This arrangement is being revised as a result of the construction by ICI of a large waste treatment plant, which will divert the wastes from the cove to a ditch.

On December 14, 1972, field survey was conducted. Core samples were taken at low tide. The cores were split into three sections representing the 0-3, 3-6 and 6-9 inch layers of sediment in the cove.

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* ICI America uses mercury in its processes.

The results of the analyses are shown in Figure 25. The higher concentrations of mercury are in the general vicinity of Muddy Cove (a small inlet of the Taunton River). T-24, which is about ten yards north of the entrance of Muddy Cove to the Taunton River, had a concentration of 17.31 ppm by dry weight and was the highest level measured in the river. T-22, which is about one half mile upstream, has a concentration of 14.61 ppm. Both of these stations are upstream of ICI, but the flood tide influence of the river extends several miles north of Dighton.

Mercury concentrations in samples immediately down stream from ICI America were also high (samples T-8 and T-9). Sample T-17, which is about two miles north of ICI had 6.45 ppm mercury, and lends some support to the idea that mercury absorbed onto fine sediment may be carried north on incoming flood tides and deposited when the floods have receded. There is also the possibility that mercury is present in the primary effluent of the Taunton waste treatment plant.

The results for Muddy Cove are shown in Figure 26. They show that the tidal action in the cove has resulted in relatively low values of mercury in the center section of the cove compared to the edge. In addition, the highest levels are generally in the upper three inches, which indicates that deposition of mercury in the cove has been relatively limited in view of the large quantities known to exist in Muddy Brook lagoon. It is possible

Sample Location	Percent Moisture	Mercury Concentration	
		Wet (ppm)	Dry
T-1	23.0	0.141	0.186
T-2	41.2	1.450	2.470
T-3	55.2	2.600	5.810
T-4	13.4	0.123	0.143
T-5	31.0	2.330	3.380
T-6	29.0	2.540	3.590
T-7	40.6	5.870	9.920
T-8	40.5	7.270	12.200
T-9	70.6	3.380	11.500
T-10	43.0	4.050	7.100
T-11	28.5	1.620	2.300
T-12	24.1	0.893	1.200
T-13	39.1	4.600	7.560
T-14	80.7	1.640	8.470
T-15	60.3	2.070	5.210
T-16	65.8	1.210	3.540
T-17	65.2	2.240	6.450

FIGURE 25
TAUNTON RIVER SURVEY RESULTS

Sample Location	Percent Moisture	Mercury Concentration Wet	 Dry
T-18	42.0	1.510	2.610
T-19	76.4	0.836	3.510
T-20	75.6	1.400	5.720
T-21	76.8	1.570	6.770
T-22	86.8	2.810	14.610
T-23	86.1	0.850	6.140
T-24	82.3	3.060	17.310

FIGURE 25 (CONTINUED)

Sample No.	Core Layer	Total Hg (Dry Wt, ppm)
N-45	0-3 3-6 6-9	3.340 0.461 10.200
N-46	0-3 3-6 6-9	29.300 26.400 13.000
N-47	0-3 3-6 6-9	9.600 4.840 5.950
N-48	0-3 3-6 6-9	5.950 2.110 1.610
N-49	0-3 3-6 6-9	18.200 0.426 0.439
N-50	0-3 3-6 6-9	62.300 0.831 0.648
N-51	0-3 3-6 6-9	53.900 116.000 3.510
N-52	0-3 3-6 6-9	131.000 2.040 1.940
N-53	0-3 3-6 6-9	7.910 2.270 2.000
N-54	0-3 3-6 6-9	47.800 2.060 0.732

FIGURE 26
MUDDY COVE CORE ANALYSIS

Sample No.	Core Layer	Total Hg (Dry Wt, ppm)
N-55	0-3	83.700
	3-6	12.600
	6-9	4.110
N-56	0-3	18.400
	3-6	3.680
	6-9	2.140
N-57	0-3	5.400
	3-6	2.710
	6-9	2.270
N-58	0-3	28.800
	3-6	6.500
	6-9	5.280
N-59	0-3	37.600
	3-6	31.100

FIGURE 26 (CONTINUED)

that in the saltwater environment of the cove, mercury has solubilized as a chloride complex (Hg Cl_4=) and thus, levels in the sediments have not built up over the years. It does not appear the much of this mercury is being released to the water column because water samples taken during the coring indicated less than 0.4 ppb total mercury.

Some methyl mercury is present in the sediments, although the percent of the total is less than what was observed in freshwater sediments. One core sample gave 154 ppb which represents 0.1 percent compared to 0.2 to 0.5 percent in the Framingham Reservoir.

Conclusions on Massachusetts Mercury Study

1. The major source of mercury to the Sudbury River system in the Ashland-Framingham area has been the Nyanza Chemical Corporation. During the period 1940-1970, approximately 100,000 lbs of mercury was transported by surface water to the river or about 3,400 lbs annually.

2. Since 1970, when Nyanza joined the municipal sewer system, the annual contribution dropped to 50-65 lbs., and with discontinuance of the use of mercury in dye-making processes, there will be a further gradual decrease. The grounds surrounding the Nyanza plant contain between 25,000 and 35,000 lbs of mercury and some runoff contamination can be expected from this source.

3. Nearly one-half of the mercury in the soils on Nyanza property is confined in a two to three acre area west of the plant. Analyses performed on nearby test wells have shown mercury pollution of ground water.

4. Inadequate sludge management practices have resulted in mercury contamination of the brook which carries water from the Nyanza area to the Sudbury River.

5. Ground water contamination is particularly serious in the sand and gravel areas located between the railroad tracks adjacent to Nyanza and the Sudbury River.

6. A series of laboratory experiments with columns simulating the leaching of mercury from contaminated soils has given the following results which are significant in ground water pollution:

(a) The mercury in contaminated soils located over predominantly sandy subsoil will leach through the sand into the ground water with relatively little of the mercury adsorbing to the sand.

(b) If the mercury is in a highly organic soil, relatively little mercury can be leached from the soil.

(c) Chemical barrier materials placed below the mercury contaminated soils will bind some of the mercury leaching through the soil and inhibit the flow of mercury to the subsoil.

7. Methyl mercury was detected in sediments and accounted for between 0.2 and 0.5 percent of the total mercury present. Methyl mercury is the most toxic form of mercury and represents about 85 to 90 percent of the total mercury usually found in fish.

8. No extensive measurement of mercury levels in Framingham Reservoir No. 1 and No. 2 was undertaken. On the basis of previous sampling, it was estimated that between 15,000 and 50,000 lbs could presently be in bottom sediments as a result of the passage of 100,000 lbs in the Sudbury River system.

9. Mercury concentrations in sediments from the Taunton River are much lower than from the Sudbury River impoundment areas.

10. Mercury determinations in Muddy Cove showed an average concentration of 36.2 ppm in the 0-3 inch layer, 14.2 ppm in the 3-6 inch layer, and 3.84 in the 6-9 inch layer. The lower concentrations below the 6-inch depth indicated that tidal action prevented the extensive accumulation of mercury contaminated sediments.

11. Methyl mercury was detected in the sediments of Muddy Cove to the extent of about 0.1 percent of total mercury.

(b) Trace Metal Analysis of Boston Harbor Water and Sediments

The Boston Harbor receives residential, municipal, and industrial inputs through Deer Island and Nat Island treatment plants, as well as unchecked overflow of combined sewer, river runoff and urban runoff. It has been estimated that about 35 percent of the discharge from the treatment plant is of industrial origin. Therefore, it is not unexpected that toxic metals would be found in the harbor.

WATER

New England* Aquarium commenced a study (under contract) of the form and concentration of metals in the waters and sediments of Boston Harbor in February 1971. The first effort was the sampling of the surface waters in the inner and outer harbor for heavy metals including cadmium, chromium and lead. Then, two 24-hour studies were set up to monitor the effects of tidal changes. The first was between February 16 and 17, 1972, and the second between April 24 and 25, 1972. Surface and bottom samples were taken every two hours at Station 7 in the inner harbor.

Figure 27 shows levels of heavy metals including cadmium, chromium and lead as determined in the surface waters of inner and outer harbor. These are compared with values derived from several studies and from theoretical estimates. The harbor values are the sum of the results of two analyses per sample in which one measures the soluble phase and the other the particulate phase. The data illustrating the distribution of these metals is shown in Figure 28. Soluble phase cadmium values for the outer harbor vary from 0.12 to 1.1 ppb with highest value recorded near the Deer Island outfall. In the inner harbor, values varied from 0.34 to 0.52 ppb in the river samples.

The result of analyses on particulate phase for cadmium show that the concentrations of cadmium were below the detectable amount

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* Consultants of Boston Massachusetts.

Element	Oceanic Average from Turekian (ppb)	Inner Harbor (ppb)	Outer Harbor (ppb)
Cd	0.11	0.42	0.29
Cr	0.2	2.8 (4.02)[1]	3.5
Cu	0.9	6.8	4.4
Ni	6.6	9.4	8.0
Pb	0.03	11.8	4.4
Zn	5.	44.	13.9

FIGURE 27
AVERAGE TRACE METAL CONCENTRATIONS IN BOSTON HARBOR SURFACE WATERS

For each station soluble phase values are given on first line; particulate phase values on second line. All values are in parts per billion.

INNER HARBOR

Sample	Zn	Cu	Pb	Ni	Cr	Cd
IH 1	61.3	2.8	2.2	13.6	1.2	.52
	5.9	2.8	6.5	2.0	2.4	ND[2]
IH 2	62.2	6.5	2.5	8.3	0.8(.58)[1]	0.53
	2.6	2.2	5.3	1.2	0.5(.47)	ND
IH 3	37.8	4.1	2.7	7.5	0.5	0.35
	2.3	1.4	5.4	2.2	2.1	ND
IH 4	30.6	6.6	10.6	9.9	1.2(2.24)	0.46
	3.8	2.1	7.3	1.3	0.7(2.56)	ND
IH 5	24.7	4.7	8.6	8.7	0.5(1.01)	0.47
	4.3	2.3	6.3	1.6	0.8(1.17)	ND
IH 6	26.2	5.8	6.1	9.1	0.8(1.97)	0.42
	2.5	2.4	6.9	2.0	1.2(2.23)	ND
IH 7	45.1	5.9	7.4	7.5	3.0(3.69)	0.56
	4.1	2.5	10.1	1.3	1.2(4.15)	ND
IH 8	33.4	3.2	3.1	7.2	0.2	0.34
	3.9	1.3	3.0	2.9	1.1	ND
AVE	40.2	5.0	5.4	7.8	1.0(1.90)	0.42
	3.7	1.8	6.4	1.6	1.8(2.12)	ND

---

1. Values in parentheses were obtained using the revised chromium method (Appendix 3-C). Samples were taken 9/19/72, others were collected between 6/11 and 6/13/72.
2. ND = Not Determined

FIGURE 28
TRACE METAL DISTRIBUTION IN BOSTON HARBOR WATERS

PRESIDENT ROADS

Sample	Zn	Cu	Pb	Ni	Cr	Cd
PR 1	20.5	4.2	2.4	ND	0.3	0.2[illegible]
	5.1	0.8	3.0	1.8	6.6	ND
PR 2	7.8	2.5	1.5	5.6	0.8	0.37
	5.9	0.8	2.9	1.2	1.1	ND
PR 3	11.0	8.6	2.2	6.7	0.3	0.11
	7.7	1.6	4.1	1.1	0.9	ND
PR 4	11.9	2.9	2.5	7.1	0.3	0.42
	13.3	2.7	3.2	3.6	4.1	ND
PR 5	16.7	7.8	1.6	13.6	0.6	1.10
	5.7	2.3	4.2	1.8	3.5	ND
AVE	11.6	5.2	2.0	8.2	0.5	0.46
	7.5	1.6	3.5	1.9	3.2	ND

DORCHESTER BAY

Sample	Zn	Cu	Pb	Ni	Cr	Cd
DB 1	17.2	3.0	1.9	5.2	0.3	ND
	1.3	0.9	2.3	5.8	6.5	ND
DB 2	7.6	2.2	2.7	3.7	0.2	0.41
	ND	0.4	0.6	1.8	3.0	ND
DB 3	11.5	2.1	2.2	4.2	0.2	0.38
	ND	0.5	ND	1.1	3.4	ND
DB 4	10.7	2.1	0.3	4.3	ND	0.09
	5.2	1.1	4.4	ND	ND	ND
DB 5	10.5	2.6	2.9	4.7	0.2	0.8
	0.1	ND	3.6	1.5	ND	ND

FIGURE 28 (CONTINUED)

DORCHESTER BAY, Cont.

Sample	Zn	Cu	Pb	Ni	Cr	Cd
DB 6	13.0	3.4	2.7	4.8	ND	0.12
	ND	ND	ND	ND	ND	ND
DB 7	8.0	2.8	1.6	6.4	0.4	0.24
	0.3	0.9	0.9	1.7	5.2	ND
AVE	11.2	2.6	2.0	4.7	0.3	0.24
	1.7	0.8	2.4	1.8	4.5	ND
THOMPSON-LONG ISLAND AREA						
TL 1	7.8	2.2	1.2	6.1	0.4	0.11
	1.8	2.5	0.5	1.2	2.1	ND
TL 2	9.5	2.7	2.0	7.4	1.2	0.14
	0.9	1.5	ND	1.7	0.8	ND
TL 3	8.9	1.9	2.7	6.9	0.1	0.29
	2.0	2.3	ND	1.1	1.5	ND
TL 4	8.7	2.2	1.6	7.1	0.3	0.24
	1.1	1.0	0.8	1.6	1.0	ND
TL 5	8.4	2.1	1.8	5.2	0.5	ND
	0.1	0.8	ND	0.4	1.3	ND
TL 6	10.4	2.4	2.0	8.2	0.5	0.22
	5.1	1.0	3.8	1.6	1.0	ND
AVE	9.0	2.2	1.9	6.8	0.5	0.20
	1.8	1.5	1.7	1.3	1.3	--

FIGURE 28 (CONCLUDED)

of the method of analysis used. In the case of lead, particulate and aqueous phases contain similar concentrations: 0.5 to 4.4 ppb and 0.3 to 2.9 ppb respectively in the outer harbor, and 10.1 to 30.0 ppb, and 2.2 to 10.6 ppb in the inner harbor. Chromium concentrations were higher in the particulate phase than in the soluble fraction: 0.8 to 6.6 and 0.1 to 1.2 ppb respectively, in the outer harbor; 0.5 to 2.4 and 0.2 to 1.2 respectively in the inner harbor. The high values for particulate chromium near the Deer Island outfall are to be expected. The significance of the higher values at the mouth of the inner harbor and off Castle Island is less obvious. These high values may be due to Deer Island effluent which flows down President Roads with the tide, or they may be due to a second source, possibly a combined sewer outfall near the mouth of the harbor.

A comparison of the two sets of particulate data below in Table 11 shows reasonable agreement for most metals.

In general, slightly higher values are evident in the April study. This could be due to higher freshwater runoff into the harbor during the spring and thus, a higher metal input, or to a higher particulate level resulting from the activities of spring algae.

The results for chromium gave clear evidence of a tidal effect on concentration in the particulate phase (Figure 29). They further suggest that a major contributor of chromium is the sewage sludge which is pumped into harbor waters. The sampling station utilized for this 24-hour sampling is located one and one-half miles to the harbor side of the Deer Island sewage outfall.

TABLE 11

METAL CONCENTRATION RANGES OVER 24 HOURS

Concentration Range ppb

Metal	2/16/72 - 2/17/72 Particulate	4/24/72 - 4/25/72 Particulate	Soluble
Cd	< 0.02 - 0.1	0.02 - 0.2	0.5 - 3.8
Cr	1.8 - 4.7	0.8 - 3.0	-
Pb	0.4 - 3.7	0.5 - 6.1	1.6 - 7.7

SEDIMENTS

The residence time for trace metals in waters of a fairly shallow harbor is probably short. This is so because of the high levels of suspended solids. Therefore, rapid absorption or co-precipitation and subsequent deposition of heavy metals would be expected to occur. For these reasons, the analyses of sediments should afford a further measure of trace metal input into the harbor waters, and deep cores would provide a history of metal buildup.

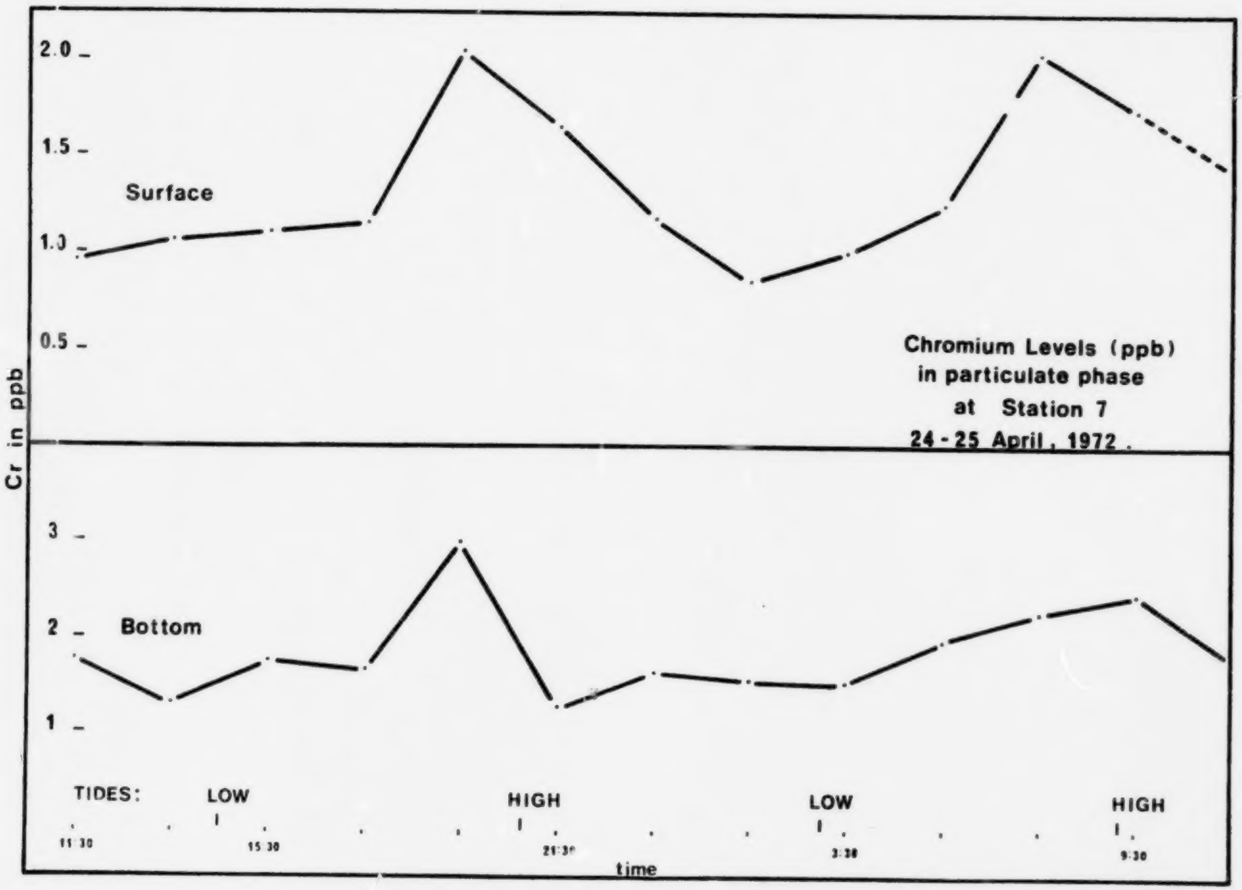

FIGURE 29
CHROMIUM LEVELS (ppb) IN PARTICULATE PHASE AT STATION 7

Approximately 100 samples were collected in the inner harbor and throughout the outer harbor with cores ranging in length between 10 and 40 cm.

The results of analyses on inner harbor samples are reported for cadmium, chromium, lead and mercury. These were done from samples taken at four stations. The data is shown below in Table 12.

TABLE 12

RESULTS OF INNER HARBOR SEDIMENTS

Metal in ppm

Station	Cd	Cr	Pb	Hg
IH1	3.3	-	161	0.92
IH2	10.0	144	675	1.50
IH3	7.8	174	411	2.33
IH4	29	116	595	5.70

These high levels in the inner harbor are not surprising in view of inputs from rivers, commercial activities and numerous combined sewage outfalls. High levels of mercury (5.7 ppm) are found at station IN4 (at the mouth of the Charles River) where the concentration is also high at 29 ppm for Cadmium.

Data on analyses of samples from the outer harbor, Figure 30, reveal generally lower concentrations for the four toxic metals than was found in the inner harbor. The distribution of trace metals in the outer harbor shows several trends. In cores greater than 10 cm in length, metal levels in almost all samples were highest at the surface. For those samples in which the cores were taken from the underlying clay, there was a marked decrease in metal levels. This probably indicates that heavy metals in the harbor's waters were much lower during the period when clay deposits were being formed. Alternatively, it could be that the highly organic layer which covers most of the harbor bottom may trap much of the metals and thus prevent their deposition into the clay layer.

Sediments in the southern portion of the harbor generally contain lower levels of trace metals which is consistent with lower levels of industrial activity in that area. There were exceptions to this finding such as in a site just south of Moon Head which is the location of a former sewage treatment plant and outfall. A direct relationship was revealed between the organic content of samples and the concentration of toxic metals. That is, higher metal values corresponded to high organic content.

Sample	Depth (cm)	Zn	Cu	Pb	Co	Cd	Ni	Cr	V	Mo	Hg	% Organic
DF 1	0	171	108	102	11	13.4	25	165	49	3.5	0.9	4.79
	10	212	87	79	17	4.0	31	188	55	7.9	4.2	5.17
	20	210	61	81	9	2.5	30	69	66	4.3	0.4	4.14
DF 2	0	-	-	-	-	-	-	-	-	-	3.3	-
DF 3	0	-	-	-	-	-	-	-	-	-	2.5	-
DF 4	0	400	206	151	18	7.6	38	402	111	9.4	2.4	8.36
	10	227	97	24	1	2.1	31	69	83	5.5	2.0	6.05
	20	340	95	125	15	2.9	31	111	50	2.8	1.4	5.89
DF 5	0	126	63	44	29	0.8	65	109	74	4.7	0.3	6.05
	10	101	21	46	17	2.6	30	104	77	6.7	0.8	-
	20	39	11	24	4	1.8	10	17	30	1.8	0.1	2.60
DF 6	0	188	105	91	9	4.8	23	179	52	9.0	4.0	6.13
	10	154	38	46	6	5.5	47	46	67	3.6	-	5.35
	20	178	53	85	9	2.1	15	61	37	3.8	-	4.64
TL 1	0	256	117	116	15	5.0	31	145	57	8.0	2.8	6.39
	10	242	92	120	16	5.5	29	99	57	6.4	-	6.48
	20	210	80	161	16	3.5	27	71	49	7.5	-	7.92
TL 2	0	-	-	-	-	-	-	-	-	-	4.1	-
TL 3	0	-	-	-	-	-	-	-	-	-	3.5	-
TL 4	0	-	-	-	-	-	-	-	-	-	2.3	-
TL 5a	0	427	129	199	-	-	9	141	40	4.6	1.8	9.10
5b	0	396	265	153	12	5.4	38	229	38	6.7	1.8	7.69
TL 6	0	-	-	-	-	-	-	-	-	-	3.8	-

FIGURE 30
ANALYSIS RESULTS OF OUTER HARBOR SEDIMENTS

Conclusions

1. The data collected on water and sediment samples from the Boston Harbor shows that substantially higher metal values occur in the inner harbor and in the vicinity of point sources such as the outfalls than in the outer harbor.

2. High metal concentrations and high levels of organic matter were found in areas near sewage outfalls in the inner harbor.

3. Interpretation of the analytical data is complicated by the tidal and estuarine currents on a relatively shallow body of water; also, by the uncertainty of dredging and dumping of spoils.

4. The data clearly shows that a large amount of heavy metals is present in sediments of the Boston Harbor.

(c) The Ten Mile River

This report is the first part of a series compiled by the Division, and is one of twelve river basins surveyed by the Water Quality Section during the summer of 1973 as a part of a basin planning program.

Nineteen stations were located on the Ten Mile River, one each on the Seven Mile and Bungay Rivers. Four chemical and bacterial samples were collected from each station over a 24-hour period and composited into one daily sample. Analyses were performed at Lawrence Experiment Station. Twenty-one samples were collected on September 18, 1973, and twenty-one on September 20, 1973, and analyzed for cadmium. Figure 31 displays the data.

STATION	9/18/73	9/20/73	AVERAGE
TM01	0.01	0.00	0.00
TM02	0.01	0.00	0.00
TM03	0.00	0.00	0.00
TM04	0.00	0.00	0.00
TM05	0.00	0.00	0.00
TM06	0.00	0.00	0.00
TM07	0.00	0.00	0.00
TM08	0.00	0.00	0.00
TM09	0.01	0.00	0.00
TM10	0.14	0.00	0.07
TM11	0.03	0.00	0.02
TM12	0.01	0.00	0.00
TM13	0.00	0.00	0.00
TM14	0.00	0.00	0.00
TM15	0.01	0.00	0.00
TM16	0.01	0.00	0.00
TM17	0.00	0.00	0.00
TM18	0.01	0.00	0.00
TM19	0.00	0.00	0.00
SM01	0.00	0.00	0.00
BG01	0.00	0.00	0.00

FIGURE 31
TEN MILE RIVER 1973 SURVEY–SUMMARY OF CADMIUM DATA (mg/1)

Only nine stations sampled on the 18th of September were found to contain cadmium ranging from 0.01 to 0.14. No cadmium was determined in any of the twenty-one stations sampled on September 20.

The data for chromium is shown in Figure 32. Sampling was done at twenty-one stations on four separate occasions. The values vary from 0.0 to 0.02 mg/l. Ten stations sampled on July 3 show values of 0.01 mg/l while eleven show 0.0 mg/l. Seven of those sampled on July 5 indicate 0.01 mg/l values and one 0.02 mg/l. Fourteen of the set sampled on September 18 show 0.01 mg/l and one shows 0.01 mg/l. Eight samples collected on September 20 indicate levels of 0.01 mg/l.

Conclusion

While these values are relatively low, they do indicate pollution which is not surprising in view of the discharge of sanitary and industrial wastes into the river. The values of other heavy metals determined such as iron, copper, nickel and zinc are generally much higher.

(d) Wastewater Discharge Survey: Connecticut River Basin--

In August 1971, a survey of the Connecticut River Basin was undertaken with the objective of assessing waste loads entering the lower Connecticut River Basin.

One hundred fifty-six sites were monitored on the main stream of the Connecticut River and on six other rivers--the Chicopee, Quaboag, Ware, Westfield, Deerfield and Millers. The objective

STATION	7/3/73	7/5/73	9/18/73	9/20/73
TM01	0.00	0.00	0.01	0.01
TM02	0.01	0.00	0.01	0.01
TM03	0.00	0.00	0.01	0.00
TM04	0.00	0.01	0.01	0.00
TM05	0.00	0.00	0.01	0.00
TM06	0.00	0.00	0.01	0.00
TM07	0.00	0.00	0.00	0.00
TM08	0.01	0.01	0.01	0.00
TM10	0.01	0.01	0.01	0.00
TM11	0.01	0.00	0.02	0.01
TM12	0.01	0.02	0.01	0.01
TM13	0.01	0.01	0.01	0.01
TM14	0.01	0.01	0.00	0.01
TM15	0.01	0.01	0.01	0.01
TM16	0.01	0.01	0.01	0.01
TM17	0.01	0.00	0.01	0.00
TM18	0.00	0.00	0.00	0.00
TM19	0.00	0.00	0.01	0.00
SM01	0.00	0.00	0.00	0.00
BG01	0.00	0.00	0.00	0.00

FIGURE 32
TEN MILE RIVER 1973 SURVEY–SUMMARY OF CHROMIUM DATA (mg/1)

was to provide information on 147 outfalls of wastes that included industrial effluents.

The consultants performed 29 analyses on each sample and the Lawrence Experimental Station analyzed each sample for eight metals. Samples were composited in proportion to flow over three separate 24-hour periods. Heavy metals were analyzed with an atomic absorption spectrophotometer at Lawrence Station while other analyses were done in accordance with procedures outlined in Standard Methods. The toxic substances of interest which were determined are arsenic, cadmium, chromium, lead and mercury. Figure 33 is included as an example of the data recorded in the report. Table 13 shows the ranges and means of the toxic substances recorded. The values are generally low for all substances except lead and chromium. These metals show highs of up to 190 mg/l for lead and 41 mg/l for chromium.

WASTEWATER DISCHARGE SURVEY
CONNECTICUT RIVER BASIN
CONNECTICUT RIVER
WEST SPRINGFIELD

OUTFALL : Springfield Sewage Treatment Plant (Bondi Island) MILE NO 75.7W

SAMPLE: 24-Hr. Composite- Sequential FLOW (MGD): Average 19.59 Maximum 26.5

Date Collected	12-17-71	12-21-71	12-22-71	Time Collected	2:30 PM	9:00 AM	8:00 AM
Sample Number	C 12844	C12856	C 12861	Sample Number	C 12844	C12856	C 12861
Acidity (mg/l CaCO$_3$)	28	36	20	Mercury (mg/l)	<0.0001	0.0008	<0.0001
Alkalinity (mg/l CaCO$_3$)	95	110	110	Nickel (mg/l)	0.03	0.00	0.01
Ammonia (mg/l N)	37.1	32.8	29.8	Nitrate (mg/l N)	0.09	0.10	0.44
Arsenic (mg/l)	0.01	0.00	0.00	Oil & Grease (mg/l)	6.0	2.4	0.0
BOD$_5$ (mg/l)	66	58	45	pH	6.8	6.9	7.0
Jug BOD$_2$ (mg/l)	48	60	12	Phenol (mg/l)	0.06	0.00	0.12
Jug BOD$_5$ (mg/l)	102	90	24	Total Phosphorus (mg/l)	3.52	3.83	3.67
Jug BOD$_7$ (mg/l)	114	126	24	Sulfate (mg/l)	68.0	68.0	57.0
Jug BOD$_{14}$ (mg/l)	138	132	24	Surfactants (mg/l)	32	40	30
Jug BOD$_{21}$ (mg/l)	138	132	40	Total Solids (mg/l)	376	738	498
Cadmium (mg/l)	0.00	0.00	0.00	Fixed (mg/l)	231	587	303
COD (mg/l)	219	190	227	Suspended Solids (mg/l)	48	70	62
Chloride (mg/l)	53.81	201.78	103.37	Fixed (mg/l)	0	8	10
Chromium (mg/l)	0.03	0.02	0.04	Settleable Solids (mg/l)	2	18	8
Color (Units)	90	230	200	Fixed (mg/l)	0	0	0
Copper (mg/l)	0.13	0.17	0.14	Settleable Solids (ml/l)	Trace	0.2	Trace
Kjeldahl N (mg/l)	19.6	23.5	21.0	Turbidity (JTU)	35	50	50
Lead (mg/l)	0.04	0.16	0.16	Zinc (mg/l)	0.38	0.38	8.2
DO (mg/l)	3.7	4.1	3.9	Flow (MGD)	19.50	19.08	21.30

FIGURE 33
WASTEWATER DISCHARGE SURVEY FORM

TABLE 13

MASSACHUSETTS WASTE WATER DISCHARGE SURVEY SAMPLES (mg/1)

1971
MAIN STREAM OF THE CONNECTICUT RIVER

Toxic Metal	No. of Samples	Minimum	Maximum	Mean
As	79	0.0	.03	.0042
Cd	49	0.0	0.1	.009
Cr	89	0.0	7.5	.311
Pb	89	0.0	38.0	.7067
Hg	89	0.0	.019	.0025

1972
MAIN STREAM OF THE CONNECTICUT RIVER

Toxic Metal	No. of Samples	Minimum	Maximum	Mean
As	81	0.0	0.0	0.0
Cd	82	0.0	.05	.0061
Cr	81	0.0	.27	.0583
Pb	81	0.0	190.0	4.6912
Hg	82	.0001	.025	.0013

TABLE 13
(Continued)

1971
CHICOPEE RIVER

Toxic Metal	No. of Samples	Minimum	Maximum	Mean
As	1	0.0	0.0	0.0
Cd	1	0.0	0.0	0.0
Cr	1	0.3	.03	.03
Pb	1	.16	.16	.16
Hg	1	.0007	.0007	.0007

1972
CHICOPEE RIVER

As	62	0.0	0.0	0.0
Cd	62	0.0	.05	.0024
Cr	62	0.0	12.0	.3284
Pb	62	0.0	2.9	.1868
Hg	62	.0001	.036	.0036

TABLE 13
(Continued)

1972
QUABOAG RIVER

Toxic Metal	No. of Samples	Minimum	Maximum	Mean
As	48	0.0	0.0	0.0
Cd	48	0.0	.01	.0009
Cr	48	0.0	41.0	.8963
Pb	48	0.0	1.5	.1858
Hg	48	.0001	.0181	.0034

1972
WARE RIVER

Toxic Metal	No. of Samples	Minimum	Maximum	Mean
As	52	0.0	.18	.0121
Cd	52	0.0	.04	.0025
Cr	52	0.0	.19	.0546
Pb	52	0.0	.51	.0904
Hg	51	.0001	.0166	.0023

TABLE 13
(Continued)

1972
WESTFIELD RIVER

Toxic Metal	No. of Samples	Minimum	Maximum	Mean
As	68	0.0	.11	.0016
Cd	69	0.0	.1	.0014
Cr	69	0.0	.23	.0406
Pb	69	0.0	.71	.0465
Hg	69	.0001	.0120	.001

1972
DEERFIELD RIVER

As	12	0.0	0.0	0.0
Cd	12	0.0	.03	.0025
Cr	12	.03	.22	.0717
Pb	12	.03	.09	.0542
Hg	12	.0003	.0165	.0032

1972
MILLERS RIVER

As	47	0.0	0.0	0.0
Cd	47	0.0	.01	.0015
Cr	47	.02	2.2	.1464
Pb	47	0.00	6.0	.4257
Hg	47	.0001	.021	.0012

2.0 MASSACHUSETTS DIVISION OF FISHERIES AND GAME

(a) Analysis of Fish Tissue for Mercury Content, July 15, 1970 to March 1971

The objective of this program was to determine if mercury was present in fish from Massachusetts waters. Fish samples for analysis were largely provided through sampling activities conducted in conjunction with previously planned fisheries work. In order to include a sample from streams throughout the state, specific collections of fish samples were made from nine rivers--Westfield, Deerfield, Nashua, Squannacook, Taunton, Blackstone, Connecticut, and Merrimack Housatonic.

Two flameless atomic absorption methods were tried and found to produce excellent results. First, there was the hot-acid digestion procedure obtained from the FDA Laboratory in Boston. The second one was a cold-wet acid digestion procedure obtained from the Massachusetts Department of Public Health (Lawrence Experiement Station). This method was evaluated as being more effective in the handling of a larger number of samples especially in a laboratory with a limited number of fume-hood facilities. A Perkin-Elmer, Model 303, Atomic Absorption Spectrophotometer which was equipped with a hollow cathode mercury lamp was used for analysis. Sample cross checks were made with other state and Federal laboratories, and the results show close agreement (Figure 34).

1. Federal Water Quality Administration

	F.W.Q.A.	Mass. F. & G.
Inorganic Mercury	0.34 ug/l	0.48 ug/l
Inorganic Mercury	4.2 ug/l	4.4 ug/l
Organic & Inorganic Mercury	6.3 ug/l	6.7 ug/l
Organic Mercury	4.2 ug/l	4.8 ug/l

2. New Hampshire Water Supply and Pollution Control Commission

	New Hampshire	Mass. F. & G.
#375	.63 ppm	.66 ppm
#383	.31 ppm	.29 ppm
#407	.16 ppm	.15 ppm
#422	.36 ppm	.38 ppm
#429	.11 ppm	.12 ppm
#430	.09 ppm	.12 ppm
# 6	.52 ppm	.52 ppm
#014726D	.93 ppm	1.86 ppm
#014727D(a)	1.1 ppm	1.2 ppm

3. Federal Food and Drug Administration - Boston

	F.D.A.	Mass. F. & G.
#014726D	1.69 ppm	1.87 ppm
#014727D(a)	1.21 ppm	1.29 ppm

4. Massachusetts Public Health Laboratory - Lawrence

	M.P.H.	Mass. F. & G.
#014726D	2.0 ppm	1.9 ppm
#014727D(b)	3.1 ppm	3.1 ppm

(a) tissue sample
(b) mixed tissue and bone sample

FIGURE 34
MERCURY CROSS CHECKS

Analysis of tissues from 59 fishes collected from 27 random statewide sample sites revealed concentrations of mercury ranging from 0.03 to 1.36 ppm (Figures 35 and 36). Eight of the 24 fishes collected from eleven streams (Figure 18) contained mercury at or above the 0.5 ppm level (FDA limit). With the exception of two alewives collected in the vicinity of a known mercury pollution source on the Taunton River in Dighton (Figure 36), all fishes containing mercury in excess of 0.5 ppm level were predators. They included walleye, smallmouth bass, largemouth bass, and chain pickerel. These fishes were collected from the Housatonic, Connecticut, Millers, and Merrimack Rivers.

Fourteen of the 35 fishes collected from lakes and ponds (Figure 35) contained mercury above the 0.5 ppm level. Except for a redbreast sunfish from Billington Sea, Plymouth, all fishes with mercury above the 0.5 ppm level were predators or of the size of predators. The chain pickerel (a predator) and yellow perch, of predator size, collected from Billington Sea did not approach the level of mercury found in the redbreast sunfish. Salmonids collected from the wild along with 22 hatchery fishes (Figure 37) were found to contain low levels of mercury, 0.32 ppm or less.

Conclusions

There was a tentative indication that mercury concentration in warm water predator fishes may be related to length, weight and/or

Location	Species	Length Total Inches	Weight Pounds	Mercury ppm
Quabbin Reservoir	Smallmouth bass	12.0	.8	.34
Quabbin Reservoir	Smallmouth bass	10.0	.5	.52
Quabbin Reservoir	Smallmouth bass	12.5	1.0	.49
Quabbin Reservoir	Smallmouth bass	13.0	1.1	.73
Quabbin Reservoir	Yellow perch	11.5	.6	.59
Quabbin Reservoir	Lake trout	18.5	2.2	.33
West Lake, Sandisfield	Largemouth bass	----	--	1.17
Billington Sea, Plymouth	Chain pickerel	15.0	.9	.40
Billington Sea, Plymouth	Chapin pickerel	11.0	.3	.16
Billington Sea, Plymouth	Yellow perch	11.5	.8	.40
Billington Sea, Plymouth	Yellow perch	9.5	.3	.20
Billington Sea, Plymouth	Redbreast sunfish	7.5	.3	.65
Crow Hill Pond, Westminster	Chain pickerel	10.5	.3	.50
Crow Hill Pond, Westminster	Chain pickerel	10.5	.2	.94
Congamond Lakes, Southwick	Largemouth bass	17.0	2.9	.69
L.C.I. Pond, Dighton	Largemouth bass	14.5	2.1	1.36
Lake Chauncey, Westboro	Largemouth bass	10.0	.5	.30
Lake Dennison, Winchendon	Chain pickerel	15.0	.9	.33
Lake Dennison, Winchendon	Chain pickerel	13.5	.6	.30
Onota Lake, Pittsfield	Chain pickerel	13.0	.4	.09
Onota Lake, Pittsfield	Chain pickerel	12.0	.4	.05
Watson Pond, Taunton	Chain pickerel	17.0	1.2	.43
Watson Pond, Taunton	Chain pickerel	16.0	1.1	.38
Stearns Pond, North Andover	Chain pickerel	14.5	.8	.20
Lake Cochituate, Natick	Largemouth bass	15.0	2.6	.52
Lake Cochituate, Natick	Largemouth bass	14.0	1.8	.34
Becket Reservoir, Becket	Chain pickerel	13.5	.6	1.35
Knops Pond, Groton	Chain pickerel	12.0	.5	.21
Knops Pond, Groton	Chain pickerel	12.5	.5	.21
Knops Pond, Groton	Yellow perch	9.0	.4	.19
Lake Boon, Hudson	Chain pickerel	17.0	1.4	.40
Lake Boon, Hudson	Chain pickerel	12.5	.7	.10
Lake Boon, Hudson	Black crappie	11.0	.8	.60
Lake Boon, Hudson	Black crappie	10.0	.6	.67
Wachusetts Reservoir	Rainbow smelt (Composite)	----	--	.51

FIGURE 35
MERCURY IN FISH–LAKES AND PONDS IN MASSACHUSETTS

Location	Species	Length Total Inches	Weight Pounds	Mercury ppm
Taunton River, Dighton 1	Alewife	10.0	.3	.50
Taunton River, Dighton	Alewife	10.0	.3	.59
Blackstone River, Millville 2	Largemouth bass	10.5	.7	.31
Blackstone River, Millville	Largemouth bass	14.0	1.7	.42
Blackstone River, Blackstone	Carp	6.0	.1	.06
Blackstone River, Blackstone	Carp	6.0	.2	.07
Connecticut River, Gill 3	Walleye	19.0	1.9	.52
Connecticut River, Hadley	White perch	10.0	.2	.19
Connecticut River, Hinsdale	Smallmouth bass	---	--	.63
Merrimack River, Lowell 4	Black crappie	11.0	1.0	.49
Merrimack River, Lowell	Largemouth bass	10.5	.7	.62
Squannacook River, Shirley 5	White sucker	9.0	1.5	.31
Squannacook River, Shirley	Goldfish	8.0	.5	.29
Nashua River, Pepperell 6	Largemouth bass	2.0	.1	.18
Nashua River, Pepperell	Yellow perch	6.0	.3	.13
Millers River, Millers Falls 7	Walleye	16.0	1.7	.58
Millers River, Millers Falls	Walleye	14.5	1.2	.99
Housatonic River, Sheffield 8	Chain pickerel	10.0	.2	.92
Housatonic River, Sheffield	Pumpkinseed	4.5	.1	.32
Deerfield River, Deerfield 9	Chain pickerel	7.5	.1	.14
Deerfield River, Deerfield	Rock bass	7.0	.2	.15
Westfield River, Westfield 10	Fallfish	10.0	.5	.30
Westfield River, Westfield	White sucker	12.5	.7	.16
Sawmill Brook, Manchester	Brook trout	6.0	--	.03*

FIGURE 36
MERCURY CONCENTRATION IN FISH—MAJOR RIVER SYSTEMS IN MASSACHUSETTS

Hatchery	Species	Length Total Inches	Weight Pounds	Mercury ppm
Sunderland	Rainbow trout	11.0	.6	.09*
	Rainbow trout	8.0	.3	.03
	Rainbow trout	7.5	.2	.03
	Brown trout	9.5	.4	.09
	Brown trout	7.5	.2	.03
	Brown trout	7.5	.2	.02
	Brook trout	9.5	.4	.07
	Brook trout	10.0	.5	.10
Sandwich	Rainbow trout	7.0	.2	.08
	Brown trout	6.0	.1	.00
	Brown trout	6.0	.1	.00
	Brook trout	7.0	.2	.00
	Brook trout	7.0	.2	.00
McLaughlin	Rainbow trout	9.5	.4	.00
	Rainbow trout	6.5	.1	.00
	Brown trout	8.5	.3	.02
	Brown trout	7.0	.2	.00
Montague	Rainbow trout	8.5	.2	.03
	Rainbow trout	8.5	.2	.04
	Rainbow trout	9.0	.2	.01
	Brook trout	6.5	.1	.00
	Brook trout	7.0	.5	.00

*Analysis by Hot Acid Digestion

FIGURE 37
MERCURY IN HATCHERY TROUT IN MASSACHUSETTS

condition factors of the fishes. The age of the fishes at the time of capture did not appear to be significant.

(b) April 1, 1971 to March 31, 1972 Study

The objective was to investigate further the mercury content of fish tissue which was initiated in July 15, 1970. Based largely on the findings of the first study, a selection of three bodies of water representing different levels of mercury in fishes was made. Framingham Reservoir #2 was selected as the body of water having the highest mercury level because of a known source of mercury pollution. Lake Chauncey was chosen as a medium-level pond (expected levels about 0.5 ppm) based on results of sampling of a small number of largemouth bass. Onota Lake was selected as a low-level lake (expected levels below 0.5 ppm) based on sampling of a small number of chain pickerel.

Two species of warm water game fishes were collected from each of the three bodies of water. A total of 148 fishes (43 largemouth bass and 105 yellow perch) were collected between June 14, 1971 and June 23, 1971. An attempt was made to collect the full range of lengths and weights of the two species sampled. All of the fishes were collected using the 230 volt A.C. electro-shockboat. The selected fishes were weighed, measured, and age determined. They were tagged, separated by species and length, and stored in polyethylene bags in freezers. Samples were stored prior to processing in the field after selection. Pre-analysis digestion of

105 fishes (43 largemouth bass and 62 yellow perch) was done using the cold-acid digestion. The fillet (muscle tissue) from each fish was homogenized and five grams of the homogenate was digested. The digested sample was analyzed using the cold vapor technique with a Perkin-Elmer 303, Atomic Absorption Spectrophotometer.

To check the precision/reproduceability of the method, a number of pre-run samples were re-analyzed. The accuracy was further checked by sending samples to laboratories using the same and different methods of analysis.

All data was key-punched on standard IBM cards and analyzed with CDC 3600 computer. Statistical tests were performed with the assistance of personnel at the Cooperative of Fisheries Unit, University of Massachusetts. The tests consisted of calculating correlation coefficients and linear regression equations. Four transformations were performed with the data:

1. X = X, Y = Y
2. X = X, Y = LOG Y
3. X = LOG X, Y = LOG Y
4. X = LOG X, Y = Y

The results of the 105 fishes analyzed are shown in Figure 38. Based upon these results, it seems that Onota Lake and Lake Chauncey show mercury levels that can be considered to be within the background levels of fishes in Massachusetts. However,

Framingham Reservoir #2

	Length		Weight				Mercury PPM (wet weight)		
Species	Inches	Centimeters	Lbs.	Grams	Age	Sex	First Run	Re-Run	Comments
Largemouth bass	4.8	12.2	.05	22.7	1	M	0.88		
	5.0	12.7	.10	45.4	2	-	2.78		
	6.4	16.2	.10	45.4	2	M	2.55		
	6.9	17.5	.10	45.4	1	M	3.53	3.58	3.5 FDA*
	7.0	17.8	.20	90.7	2	F	1.93	1.89	
	7.8	19.8	.20	90.7	2	F	.52		.55-.64 MPH**
	8.5	21.6	.30	136.1	2	F	1.07	1.33	
	10.6	26.9	.70	317.5	2	M	1.89	1.83	1.6 FDA*
	12.0	30.5	.90	408.2	3	M	5.97		4.5-4.2 MPH**
	14.5	36.8	1.80	816.5	4	F	6.23	7.44	6.9 FDA*
	16.0	40.6	2.70	1224.7	6	F	9.48		5.9-6.0 MPH**
	17.0	43.2	2.90	1315.4	5	F	8.18		5.8-6.0 MPH**
	17.0	43.2	3.30	1496.9	6	F	12.43		7.5-7.6 MPH**
Yellow perch	3.6	9.1	.05	22.7	1	-	2.50		
	3.8	9.6	.05	22.7	1	F	3.37		
	3.9	9.9	.05	22.7	1	-	2.37		
	4.0	10.2	.05	22.7	1	-	2.10		
	4.0	10.2	.05	22.7	1	-	2.64		
	4.6	11.7	.05	22.7	1	-	2.38		
	4.7	11.9	.05	22.7	2	-	3.40		
	4.9	12.4	.05	22.7	2	-	2.20		
	4.9	12.4	.05	22.7	2	-	3.30		
	5.1	12.9	.10	45.4	2	F	0.93		
	5.1	12.9	.05	22.7	2	-	2.50		
	5.2	13.2	.10	45.4	2	-	3.18		
	5.2	13.2	.10	45.4	2	-	2.80		
	5.3	13.5	.10	45.4	2	M	2.20		
	5.6	14.2	.10	45.4	2	F	1.87		
	5.6	14.2	.10	45.4	2	M	2.67		
	5.6	14.2	.10	45.4	2	F	2.87		
	5.6	14.2	.10	45.4	2	F	2.47		
	5.6	14.2	.10	45.4	2	-	1.90		

*FDA = Federal Food and Drug Administration Laboratory, Boston

**MPH = Commonwealth of Mass. Dept. of Public Health Laboratory, Lawrence

FIGURE 38
MERCURY LEVELS IN FISH IN MASSACHUSETTS WATERS

Lake Chauncey

Species	Length		Weight		Age	Sex	Mercury PPM (wet weight)	
	Inches	Centimeters	Lbs.	Grams			First Run	Re-Run
Largemouth bass	3.6	9.1	.05	22.7	1		0.00	
	4.4	11.2	.05	22.7	1	F	0.06	
	4.5	11.4	.05	22.7	1	M	0.10	
	6.8	17.3	.10	45.4	2	M	0.13	
	7.0	17.8	.20	90.7	2	F	0.18	
	7.6	19.3	.20	90.7	2	M	0.15	
	8.0	20.3	.30	136.1	2	M	0.24	
	8.2	20.8	.30	136.1	2	M	0.15	
	8.9	22.6	.30	136.1	4	M	0.29	
	9.4	23.9	.40	181.4	3	M	0.31	
	9.8	24.9	.50	226.8	3	M	0.26	
	10.0	25.4	.50	226.8	3	F	0.19	0.17
	10.0	25.4	.50	226.8	3	F	0.28	
	10.2	25.9	.40	181.4	3	F	0.18	
	11.0	27.9	.70	317.5	4	F	0.17	
	11.2	28.4	.80	362.9	4	F	0.23	
	11.9	30.2	1.00	453.6	4	F	0.28	0.32
	12.6	32.0	1.00	453.6	4	M	0.25	
	14.2	36.1	1.50	680.4	5	F	0.42	
Yellow perch	3.8	9.6	.05	22.7	1	-	0.06	
	3.9	9.9	.05	22.7	1	-	0.03	
	4.0	10.2	.05	22.7	1	-	0.05	
	4.0	10.2	.05	22.7	2	-	0.13	
	4.7	11.9	.05	22.7	2	M	0.10	
	5.0	12.7	.05	22.7	2	-	0.08	
	5.4	13.7	.10	45.4	2	-	0.09	
	5.6	14.2	.10	45.4	2	M	0.14	
	5.8	14.7	.10	45.4	2	-	0.16	
	6.0	15.2	.10	45.4	2	-	0.14	
	6.2	15.7	.10	45.4	2	F	0.08	0.12
	6.5	16.5	.10	45.4	2	M	0.11	0.13
	6.7	17.0	.10	45.4	2	M	0.12	
	7.2	18.3	.10	45.4	2	F	0.11	
	7.4	18.8	.20	90.7	3	M	0.05	0.05
	8.0	20.3	.20	90.7	3	M	0.17	
	8.0	20.3	.30	136.1	3	M	0.23	
	8.5	21.6	.30	136.1	5	-	0.20	
	9.0	22.9	.30	136.1	5	M	0.28	
	9.2	23.4	.40	181.4	4	F	0.27	
	10.0	25.4	.50	226.8	4	M	0.33	
	10.2	25.9	.50	226.8	7	F	0.29	
	10.3	26.2	.60	272.1	6	M	0.30	
	11.7	29.7	1.00	453.6	8	M	0.39	
	12.2	31.0	.90	408.2	9	F	0.53	

FIGURE 38 (CONTINUED)

Onota Lake

	Length		[illegible]				Mercury PPM (wet weight)	
Species	Inches	Centimeters	[illegible]	Grams	Age	Sex	First Run	Re-Run
Largemouth bass	5.7	14.5	.10	45.4	1	-	0.16	
	6.1	15.5	.10	45.4	2	-	0.14	
	6.3	16.0	.10	45.4	2	-	0.11	
	6.8	17.3	.20	90.7	2	-	0.15	
	11.8	30.0	.80	362.9	4	-	0.45	0.31
	12.1	30.7	1.00	453.6	5	-	0.57	0.42
	12.2	31.0	1.00	453.6	4	-	0.23	0.23
	12.6	32.0	1.00	453.6	4	-	0.32	0.30
	14.5	36.8	1.70	771.1	4	-	0.85	
	17.6	44.7	3.30	1496.8	9	-	1.02	
	19.1	48.5	4.60	2036.5	10	-	1.30	
Yellow perch	3.3	8.4	.05	22.7	1	M	0.04	
	3.4	8.6	.05	22.7	1	-	0.11	
	3.5	8.9	.05	22.7	1	F	0.14	
	3.5	8.9	.05	22.7	1	M	0.08	
	4.2	10.7	.05	22.7	1	M	0.06	
	6.0	15.2	.10	45.4	3	M	0.10	
	6.7	17.0	.10	45.4	4	M	0.18	
	6.9	17.5	.10	45.4	3	-	0.12	
	7.0	17.8	.20	90.7	5	F	0.13	
	7.5	19.0	.20	90.7	6	M	0.10	
	7.5	19.0	.20	90.7	6	F	0.17	0.20
	8.2	20.8	.30	136.1	7	M	0.15	
	8.4	21.3	.30	136.1	9	-	0.30	
	8.6	21.8	.30	136.1	7	M	0.33	0.29
	9.1	23.1	.30	136.1	9	M	0.46	
	9.2	23.4	.40	181.4	8	M	0.22	0.15
	9.7	24.6	.40	181.4	8	M	0.37	
	9.8	24.9	.40	181.4	7	M	0.58	0.50

FIGURE 38

Framingham Reservoir is a body of water which has received mercury contamination and far exceeds these background levels.

A positive linear relationship was reportedly found to exist between mercury concentration (dependent variable) and length, weight and age (in independent variables) for the two species from each lake in all instances. A measure of the linear relationship between two variables is shown by the correlation coefficient. A perfect direct relationship is given by an r-value of $r = 1.0$, while a perfect indirect or inverse relationship is given by an r-value of $r = 1.0$, $r = -1.0$. The samples of yellow perch from Framingham Reservoir were not completely representative and thus did not show the above mentioned linear relationship. The fish population collected from this reservoir lacked older members unlike the lakes.

An equation of a straight line of the form $Y = A + BX$ was calculated using the least square method for all combinations of variables having a significant r-value at the one percent level. These equations can be used to calculate expected mercury concentrations of fish at lengths, weights or ages within the sample range. For example, by calculation a 13-inch largemouth bass for all three bodies of water would be Framingham--6.35 ppm, Lake Chauncey--0.34 ppm, and Onota Lake--0.61 ppm. Similarly, a 9.5 inch yellow perch for the two bodies of water that have determined equations would be Lake Chauncey—0.25 ppm; Onota Lake—0.35 ppm. Calculations of the mercury content can also be done using variables of age and weight. The calculated values only approximate the actual value if such a fish were analyzed. The closeness of the calculated and actual values would depend upon the value of r.

An important aspect of the study was to keep as many variables as possible constant. First, the time of fish collection was kept as short as possible as there is evidence that mercury levels in fish may be related to seasons. All the fishes in this study were collected between June 14 and June 23, 1971. Thus, there could be disparity between these results and results of samples collected during the winter from the same body of water. Second, the method of collection was the same for all three bodies of water. Electroshocking was considered the best method and was used throughout. Third, collection of fish samples was restricted to a small area of the body of water. This is particularly important in Framingham Reservoir, an impoundment. It could be found that mercury in fishes nearest the inlet could show levels different from those taken nearest the dam. The importance of sex as a variable was not determined, and this creates one source of error which might contribute to a less significant r-value.

The precision of the cold-acid digestion and the atomic absorption cold-vapor technique was tested by rerunning a number of samples: Eighteen samples were re-analyzed and the results were included in Figure 38. The differences, even in the high concentrations of Framingham Reservoir, were not substantial. Variation would be expected to exist even in a homogenized sample. Furthermore, the higher concentrations have a high dilution factor incorporated in the final result which tends to enlarge any variation or error.

The accuracy was tested to some extent by sending pre-analyzed samples to the Federal FDA, which used a hot-acid digestion. Samples were also sent to Massachusetts Department of Public Health Laboratory (MPH) with a similar or cold-acid digestion. All three determinations were in agreement on the low levels of mercury (Figure 38) for largemouth bass. The FDA results and those of the study were in agreement on one moderately high reading. Disagreement was more obvious between higher values reported by MPH and the study's own determinations. The results as determined by all three sources indicate the same trend--increases in mercury concentration with increasing length, weight and age.

Conclusion

The study confirmed convincingly that mercury concentration in fish tissues will vary directly with the length, weight and age. The relationship between the reported level of mercury in fish and those of the bodies of water was not shown although they would have aided a more complete understanding of the mechanism of mercury pollution.

(c) Pesticide Monitoring Programs—April 1, 1970 - March 31, 1971

This report deals with research and demonstration projects which sought to investigate pesticide monitoring techniques, and demonstrate the use of specialized analytical methods for quantitative determination of hydrocarbon concentrations in water and aquatic organisms. The initial objectives of the project were as follows:

1. To monitor the major watersheds of the Commonwealth of Massachusetts for organochlorine and organophosphorous pesticide residues to determine pesticide pollution.
2. To investigate the use of carbon absorption columns for monitoring pesticides at established water quality monitoring stations.
3. To investigate the use of freshwater mussels as indicator organisms to supplement fish samples.
4. To demonstrate the use and interpretation of gas chromatography, infrared spectrophotometry and other analytical techniques for detection. These objectives were subsequently modified to eliminate carbon absorption columns because of the properties of the pesticide compounds.

Twenty-five sampling stations were established on major streams in Massachusetts and fish samples were collected from all except the Deerfield, Millers, Merrimack and two stations on the Connecticut River. Lack of samples from these stations did not necessarily reflect a complete absence of fish, but was more directly a result of the location of the stations and the capability of the collection gear.

Five fishes, where possible of the same specie, size and weight, were selected from each station for individual analysis. The entire fish was pulverized and a one-gram sample used for analysis using gas chromatography.

Cages for mussels were constructed of one-half inch mesh galvanized hardware cloth, one cubic foot in size. Mussels were selected from Big Alum Pond, Sturbridge for stocking cages. Three mussels from each station were selected and prepared for analysis as individual samples. Because mussel samples were being analyzed for chlorinated hydrocarbon as well as organophosphate pesticides, a different method of extraction was used than that used for fish. The mussels were prepared and screened to determine the presence of organophosphate compounds prior to analysis for chlorinated hydrocarbons. All samples were eventually analyzed for chlorinated hydrocarbons and polychlorinated biphenyls (PCB) with gas chromatography.

The results of analysis of 85 fishes from 16 stations showed that PCB's, specifically Aroclor 1248 and Aroclor 1260 were encountered. Mean levels (Table 14) above 5 ppm were found in fishes from the Blackstone, Ware, Westfield, Chicopee, Little and Housatonic Rivers with ranges from 5.2 to 32.8 ppm.

Analyses on 337 mussels from 22 stations are shown in Table 15. PCB's, Aroclor 1248 and Aroclor 1260 were found at ten of these stations with values ranging from 2.7 to 415.4 ppb. Tests performed

TABLE 14

MEAN CONCENTRATIONS OF PCB COMPOUNDS FOUND IN FISH

1 August 1970 to 30 April 1971

Stream	PCB's (ppm Dry Weight)	
	Aroclor 1248	Aroclor 1260
Blackstone	0	13.7
Concord	0	0
Assabet	0	0
Ware	32.8	0.8
North	0	0
Pamet	0	0
Westfield	5.2	2.4
Chicopee	6.2	0.4
French	0	0.8
Quinebaug	0	0
Ipswich	0	0
Little	13.4	2.1
Swift	0	0
Quaboag	0.9	0.9
Charles	0	2.3
Housatonic	1.1	10.8

TABLE 15

MEAN CONCENTRATIONS OF PCB COMPOUNDS FOUND IN MUSSELS

1 August 1970 to 30 April 1971

Stream	PCB's (ppb Dry Weight)	
	Aroclor 1248	Aroclor 1260
Sudbury	0	0
Concord	0	0
Blackstone	0	74.1
Ware	415.4	0
Taunton	0	9.3
Charles	0	0
North	0	2.7
Chicopee	123.9	0
Connecticut #3	220.4	15.4
Assabet	0	0
Deerfield	0	0
Weweantic	0	0
Pamet	0	0
French	0	0
Little	3.1	0
Connecticut #1	161.2	26
Ipswich	0	0
Westfield	72.3	0
Connecticut #2	264.2	25

TABLE 15
(Continued)

Stream	PCB's (ppb Dry Weight)	
	Aroclor 1248	Aroclor 1260
Quinebaug	0	0
Swift	0	0
Quaboag	0	0

on control mussel samples reveal no PCB's although background levels were detected for other pesticides.

Conclusion

The main conclusion drawn from the study is that freshwater mussels introduced into a lotic* environment can be utilized as a biological monitor of organochlorine and organophosphate insecticides as well as PCB's.

(d) Presence of PCB in Housatonic River July 1971

This program was planned as a follow-up to the study which ended in March 1971. In that study, PCB's were detected in fish and caged mussels collected from the Housatonic River and the conclusion was drawn that mussels could be useful as biological monitors, so a program was planned to test the hypothesis further.

For the July 1971 program, three areas on the Housatonic River were chosen for sampling and fishes were collected from each. One sample station, H1, was an upstream location. It is situated in Hinsdale on Route 8, one mile off the intersection of Routes 3 and 143. The water at that location is cold, clear and fast-flowing. White suckers and brook trout were collected with dip nets. A second station, H2, is located in Pittsfield on Routes 8 and 9 behind the K-Mart store, 5.2 miles downstream from H1. The water in that area is turbid and fast-flowing, underlain with a gravel bottom. Collection in this area yielded only white suckers which were used for analysis. A third location was station H3 in Pittsfield about 6.1 miles downstream of H2. The river is wider in this area, flows more slowly and the bottom is sandy. White suckers and pumpkinseeds were collected. All the fishes from the three stations were collected on 7 July 1971. Cages of mussels were introduced for subsequent collection and analysis.

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*Refers to running waters, rivers, streams, as different from lentic waters like ponds and lakes.

In September, two additional stations were chosen in Pittsfield near the General Electric plant. They were located between H2 and H3. The station at Newell Street is 3.3 miles downstream from H2. The other at Lyman Street is 0.6 mile down from Newell Street. Water and sediment samples were collected at both of these stations.

Fishes and mussels collected were freeze-dried and ground for analysis by the same method used in the previous study. Water samples were extracted with hexane, while sediment samples were fan-dried and extracted with hexane. Final analysis was carried out on a Tracor gas chromatograph, Model MT-220.

PCB detected in the fish samples collected from sample areas H1, H2 and H3 was diagnosed to be Aroclor 1260. However, the chromatograms of Aroclor 1262 are very similar to those of 1260, so it is possible that 1262 was present. The results are displayed in Table 16.

TABLE 16

FISH SAMPLES COLLECTED IN JULY 1971
(DRY WEIGHT IN ppm)

Station	Number and Species	Range Aroclor 1260	Mean Aroclor 1260
H1	5 Brook Trout	0	0
H2	5 White Sucker	9.9 - 22.9	15.1
H3	5 White Sucker	48.4 - 79.5	69.4

Mussels placed in the river on July 7 were collected on September 3--a period of 58 days. During this period, it appears as if the mussels concentrated the PCB (Aroclor 1260) by their feeding process of filtering water (Table 17).

TABLE 17

PCB's IN MUSSEL COLLECTED 3 SEPTEMBER 1971
(ppm DRY WEIGHT)

Station	Number of Mussels	Range Aroclor 1260	Mean Aroclor 1260
H2	5	0	0
H3	5	8.4 - 36.5	21.5

The results suggest that the source of PCB's in the Housatonic River lies between H2 and H3. Further investigations were carried out in the area on water samples from below the Newell Street and Lyman Street bridges, where oil was seen. There were no PCB's detected in the water, probably because of the very low solubility of PCB's. Sediment samples taken in the same area revealed the presence of PCB (Aroclor 1260) in ranges of 0.07 to 19.5 ppm (Table 18).

TABLE 18

ANALYSIS OF SEDIMENT SAMPLES OF 9 NOVEMBER 1971

Station	Aroclor 1260 Concentration (ppm)
H2	0.07
Newell	0.50
Lyman	19.5
H3	9.5

Conclusions

1. The initial fish collections suggest that the source of PCB's in the Housatonic River lies in Pittsfield, Massachusetts, near station H2. Since fishes have the ability to migrate upstream as well as downstream, the source could be in either direction from H2. The

large increase in PCB's from H2 and H3 suggests introduction between these two sample stations.

2. The results of the analyses of mussels further demonstrate that the source of Aroclor 1260 in the east branch of the Housatonic River is between H2 and H3, as the mussels were caged and they fed by filtering water which flowed in only one direction.

3. The results of the water analysis indicate the low solubility of PCB's in water.

4. Analysis of the sediment samples substantiates the results of the fish and mussels analyses. The most striking observation from the data in Table 18 is the large difference between the Newell Street and Lyman Street sampling stations, where an increase of 19 ppm Aroclor 1260 occurs. At sampling station H3 which is a few miles downstream, the sediments still contain nearly 10 ppm Aroclor 1260.

5. The source of the PCB's was thought to be General Electric which is located between Newell and Lyman Streets sampling stations.

(e) Pesticide Program--April 1972 - March 1973

This report covers the third year of a three-year research and demonstration project on chlorinated-hydrocarbon pesticide monitoring in the aquatic environment.

Fish samples were collected from 22 streams across the commonwealth. As in 1971, fishes were collected from two locations on the Merrimack River. Previous years' data had indicated a need for more extensive studies on the Chicopee, Ware, Millers and Otter

Rivers to determine the sources and extent of PCB pollution. Fish collection methods were similar to those used in 1971. Freshwater mussels were obtained from Big Alum Pond, Sturbridge. Recorded sample data for fish and mussels included date of collection, location, species, length, girth and weight.

Aroclor 1260 was found in the Blackstone River during the 1972 sampling at a level of 21.3 ppm. No samplings were collected from the Housatonic River in 1972 owing to the exhaustive sampling of 1971.

Table 19 shows the results of the PCB analyses for fish collected in 1972. Aroclor 1248 is the most widespread PCB in Massachusetts and was detected in nine rivers that year. However, in six out of seven streams, there was a decrease from the 1971 levels, which might be linked to the fact that its manufacture has been discontinued. The most significant decrease was in the Blackstone River, where Aroclor 1248 dropped from 86 ppm in 1971 to 10 ppm in 1972. A dead white sucker collected from the Millers River found in Athol was analyzed and contained 197 ppm Aroclor 1248. This was the only fish collected from Millers River since 1967.

Ar[illegible] 1254 was determined in five streams in the 1972 sampling as [illegible]d to four in the 1971 sampling. The addition was the Quaboag River, while the Charles, Concord, and Sudbury Rivers showed slight decrease in Aroclor 1254. However, the Taunton River showed a slight increase. Figure 39 shows ranking for 1971-1973 for the streams sampled.

TABLE 19

MEAN CONCENTRATIONS OF PCB's IN FISH COLLECTED DURING 1972 (ppm Dry Weight)

Stream	Date of Collection	No. & Species	Aroclor Compounds
Assabet	8/15/72	5 Bluegills	Trace
Blackstone	10/04/72	5 White Sucker	10.10 (1248)
Charles	8/13/72	5 Pumpkinseed	8.3 (1254)
Chicopee	10/09/72	5 Pumpkinseed	13.32 (1248)
Concord	8/10/72	5 Bluegill	5.98 (1254)
Deerfield	9/11/72	5 Fallfish	23.8 (1248)
French	8/28/72	5 Bluegill	-
Ipswich	9/27/72	5 Pumpkinseed	-
Little	9/18/72	5 Golden Shiner	9.43 (1248)
Merrimack	9/27/72	5 Pumpkinseed	-
Millers	1972	1 White Sucker	197 (1248)
North	8/13/72	5 Bluegill	-
Pamet	9/15/72	4 Pumpkinseed	-
Quaboag	9/06/72	5 Redbreast Sunfish	111 (1254)
Quinebaug	8/07/72	5 Redbreast Sunfish	Trace
Sudbury	8/30/72	5 Bluegill	7.05 (1254)
Swift #2	7/26/72	5 Bluegill	-
Taunton	10/17/72	5 Bluegill	3.10 (1254)
Ware #2	10/25/72	5 Pumpkinseed	3.35 (1254)
Westfield	10/13/72	5 Pumpkinseed	11.9 (1254)
Weweantic	9/14/72	5 Pumpkinseed	-

Stream and Station	Town	No. and Species	Aroclor (ppm)	Rank	
				1972	1971
		Aroclor 1248			
Millers	Athol	1 White sucker	197.0	1	*
Deerfield	Deerfield	5 Fallfish	23.8	2	5
Merrimack #1	Tyngsboro	5 Pumpkinseed	19.1	3	-
Connecticut	Northampton	5 Fallfish	17.7	4	6
Merrimack #2	Haverhill	3 Alewives	13.3	5	4
		1 Eel			
		1 Banded killifish			
Chicopee	Ludlow	5 Pumpkinseed	13.3	6	2
Westfield	Westfield	5 Pumpkinseed	11.9	7	3
Blackstone	Millville	5 White sucker	10.1	8	1
Little	Westfield	5 Golden shiner	9.41	9	7
Ware	Thorndike	5 Pumpkinseed	3.32	10	-
		Aroclor 1260			
Blackstone	Millville	5 White sucker	21.3		
		Aroclor 1254			
Charles #2	Cambridge	5 Pumpkinseed	8.3	1	1
Concord	Concord	5 Bluegill	5.96	2	2
Taunton	Taunton	5 Bluegill	3.13	3	3
Quaboag	Palmer	5 Redbreast sunfish	1.11	4	-

* No fish could be collected in previous years.

FIGURE 39
MEAN POLYCHLORINATED BIPHENYL CONCENTRATIONS (PPM DRY WEIGHT)
IN FISH COLLECTED IN 1972

3.0 DEPARTMENT OF NATURAL RESOURCES AND DEPARTMENT OF PUBLIC HEALTH

(a) Toxic Substances Survey

In 1970, concern about mercury contamination* of shellfish harvested from Taunton River led to a comprehensive program to evaluate the levels of mercury in the environment in Massachusetts. The survey included examinations of:

1. Drinking water supplies
2. Shellfish harvesting areas
3. Industrial waste waters
4. River and estuarine waters and sediments
5. Sewage treatment digestors

The surveillance represented a cooperative effort between the Department of Natural Resources and the Department of Public Health. Initial efforts were aimed at ascertaining mercury levels in drinking water in over 200 municipal supplies in the state. These were found to contain mercury levels well below the U. S. Public Health Service proposed standard of 0.005 ppm. The majority of drinking water samples possessed less than 0.0002 ppm and none showed mercury concentration higher than 0.0004 ppm. The results indicated that there was no mercury problem in the drinking water supplies in Massachusetts.

---

*Shellfish found to have close to the 0.5 ppm Hg FDA limit for seafoods.

The ability of aquatic organisms to concentrate mercury from the environment alerted the Division of Environmental Health to investigate mercury levels in shellfish. For this purpose, shellfish areas yielding over 98 percent of the marketable production in the state were sampled and analyzed for mercury levels. Two areas were found to contain levels of mercury in excess of FDA's limit of 0.5 (interim) and were subsequently closed. It was found that mercury contamination resulted from mercury content of anti-fouling paints used on the hulls of boats.

Sources of Mercury Pollution

A survey of Massachusetts industries uncovered six active sources of mercury pollution. Two of these have discontinued using mercury as of January 1, 1971, and other plants have achieved a 90 percent reduction within six months. Sludge samples from sewage treatment plants were analyzed for mercury and other trace metals, so that estimates of amounts of metal being discharged to sewers could be made.

During the early stages of the program, a decision was made to carry out a two-year in-depth survey of various toxic elements in fish, shellfish, sediments and water of the Commonwealth. This was a joint decision involving the Division of Fisheries and Game. The Division of Water Pollution Control and the Department of Public Health.

The Division of Water Pollution Control is responsible for collecting and delivering samples, while the analyses were conducted at the Department of Public Health's laboratory at the Lawrence Experiment Station. Other related agencies would also provide additional samples.

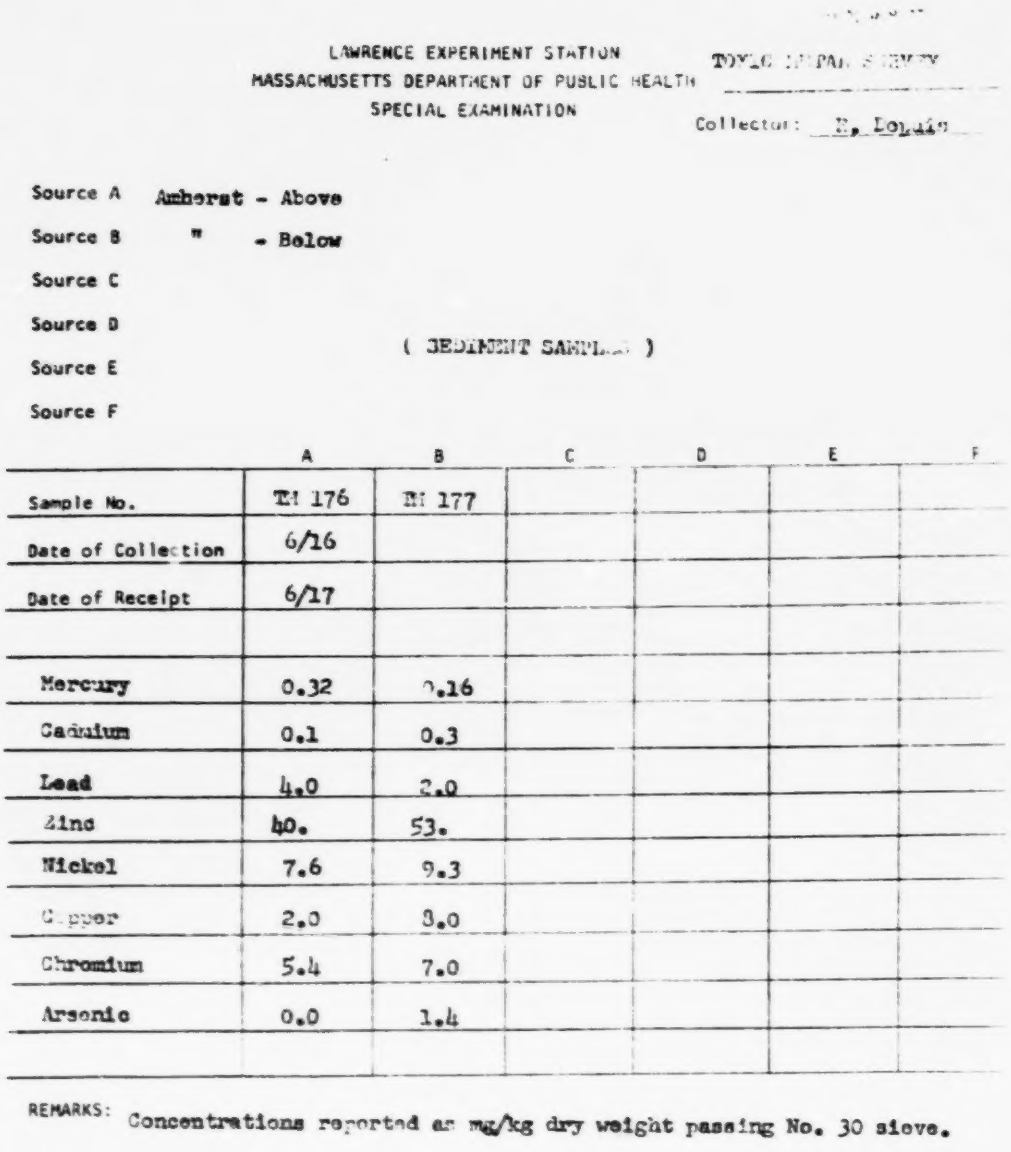
From February 1971 to January 1974, over 1500 samples have been analyzed--zinc, cadmium, copper, chromium, mercury, nickel, arsenic, lead and volatile solids. Of these, cadmium, chromium, mercury, arsenic and lead are pertinent to this report. Most of the samples are from sewage sludges, river sediments and marine shellfish, but water samples, finfish (marine and freshwater) and freshwater mussels have also been sampled and analyzed. Figure 40 illustrates the recording of these analyses. Table 20 shows how data was recorded at MITRE.

RESULTS

Shellfish

The ability of shellfish to accumulate detectable concentrations of heavy metals from their environment is well known. The FDA initiated a program in 1969 to collect data on metals in shellfish in areas of the Atlantic, Pacific and Gulf Coasts of the United States. The following conclusions were subsequently drawn by FDA:

1. The concentrations of metals in shellfish depends upon the metal concentrations available in the marine environment.



LAWRENCE EXPERIMENT STATION
MASSACHUSETTS DEPARTMENT OF PUBLIC HEALTH
SPECIAL EXAMINATION

TOXIC METAL SURVEY

Collector: E. [illegible]

Source A Amherst - Above
Source B " - Below
Source C
Source D
Source E
Source F

(SEDIMENT SAMPLES)

	A	B	C	D	E	F
Sample No.	EM 176	EM 177				
Date of Collection	6/16					
Date of Receipt	6/17					
Mercury	0.32	0.16				
Cadmium	0.1	0.3				
Lead	4.0	2.0				
Zinc	40.	53.				
Nickel	7.6	9.3				
Copper	2.0	8.0				
Chromium	5.4	7.0				
Arsenic	0.0	1.4				

REMARKS: Concentrations reported as mg/kg dry weight passing No. 30 sieve.

FIGURE 40
MASSACHUSETTS TOXIC METAL SURVEY DATA SHEET

TABLE 20
MASSACHUSETTS TOXIC METAL SURVEY RESULTS

SAMPLE NUMBER	DATE SAMPLED	TOXIC SUBSTANCE	MATERIAL SAMPLED	DATA VALUE	UNIT OF MEASUREMENT	SAMPLE ORIGIN
TM176	6/16/71	Hg	SEDIMENT	.32	mg/kg * DRY WT. #30 SIEVE	AMHERST-ABOVE
"	"	Cd	"	.1	"	"
"	"	Pb	"	4.0	"	"
"	"	Cr	"	5.4	"	"
"	"	As	"	0.0	"	"
TM177	"	Hg	"	.16	"	AMHERST-BELOW
"	"	Cd	"	.3	"	"
"	"	Pb	"	2.0	"	"
"	"	Cr	"	7.0	"	"
"	"	As	"	1.4	"	"

* CONCENTRATIONS REPORTED AS MG/kg DRY WEIGHT PASSING NO. 30 SIEVE.

2. The levels of metal varied over different areas within the same species. For example, the metal content of oysters in the northeast is generally higher than those from the south.

3. The content of a particular metal varied among species.

Table 21 below shows the statistical characteristics of preliminary findings.

TABLE 21

STATISTICAL VALUES OF METALS FOUND IN THREE SPECIES OF SHELLFISH

	Oyster		Quahog		Soft Shell	
Toxic Element	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Cadmium	0.78	0.48	0.26	0.31	0.30	0.33
Chromium	0.08	0.13	1.2	0.89	1.96	0.77
Lead	0.29	0.13	1.9	1.2	5.45	8.09
Mercury	–	–	0.30	0.21	0.31	1.06

The data is based on 52 samples of four oysters, eighteen quahogs and thirty soft shell clams.

Between 1971 and 1974, about 211 samples were analyzed for shellfish which included clams, oysters and quahogs. Cadmium, chromium, lead and mercury were determined. Table 22 shows the ranges and mean values of these metals. All 211 samples were analyzed for mercury, while 141 samples were analyzed for each of the other metals.

TABLE 22

MASSACHUSETTS SHELLFISH SAMPLES
(mg/kg Wet Wt.)

1971

Toxic Metal	No. of Samples	Minimum	Maximum	Mean
Hg	103	0.0	6.0	.37
Cd	96	0.0	3.7	.78
Pb	96	0.0	135.0	7.41
Cr	96	0.0	33.0	2.25

1972

Toxic Metal	No. of Samples	Minimum	Maximum	Mean
Hg	38	.03	1.35	.33
Cd	38	0.0	.5	.22
Pb	38	0.3	12.0	2.35
Cr	38	0.2	6.6	1.69

1973

Toxic Metal	No. of Samples	Minimum	Maximum	Mean
Hg	29	.06	1.8	.36
Cd	7	.1	.3	.14
Pb	7	1.1	2.5	1.7
Cr	7	.5	1.6	.91

1974

Toxic Metal	No. of Samples	Minimum	Maximum	Mean
Hg	41	.06	1.0	.39

Finfish

Sixty-eight samples were analyzed between 1971 and 1973 for mercury. Sixty were analyzed for cadmium, chromium and lead. The ranges and mean values are displayed in Table 23.

Sludge

In 1972, eighty sludge samples were analyzed for arsenic, cadmium, chromium, lead and mercury. Table 23 shows the means and ranges of the results.

Core

Forty-five core samples were analyzed for cadmium, chromium, lead and mercury. Twenty-two samples were tested for arsenic. The means and ranges are shown in Table 24.

Sediments

Between 1971 and 1974, 550 river sediment samples were analyzed for mercury. There were 522 samples for arsenic, cadmium, chromium, and mercury and 516 samples for lead. The data in Table 25 shows values ranging up to 3,200 mg/kg (dry weight passing #30 sieve) for chromium.

Water

During 1971, forty water samples from different areas were analyzed for mercury; forty-two samples were done for cadmium, chromium and lead, and twenty-eight for arsenic. Detection of toxic substances in these samples was substantially lower than other media tested. Lead and chromium registered the highest

TABLE 23

MASSACHUSETTS FINFISH SAMPLES
(mg/kg Wet Wt.)

1971

Toxic Metal	No. of Samples	Minimum	Maximum	Mean
Hg	22	.10	7.55	2.26
Cd	17	0.0	3.6	.83
Pb	17	0.0	33.0	5.91
Cr	17	.50	2.7	.96

1972

Toxic Metal	No. of Samples	Minimum	Maximum	Mean
Hg	25	.07	9.5	1.32
Cd	25	0.0	.1	.03
Pb	25	.10	1.2	.51
Cr	25	.30	1.0	.87

1973

Toxic Metal	No. of Samples	Minimum	Maximum	Mean
Hg	21	.16	.94	.51
Cd	2	0.0	0.0	0.0
Pb	2	1.10	1.4	1.25
Cr	2	.30	.30	.30

TABLE 24

MASSACHUSETTS CORE AND SLUDGE SAMPLES
(mg/kg Dry Wt. Passing #30 Sieve)

CORE - 1971

Toxic Metal	No. of Samples	Minimum	Maximum	Mean
Hg	45	.10	3.20	.67
Cd	45	0.0	7.50	1.15
Pb	45	1.00	250.0	64.07
Cr	45	1.90	250.0	46.49
As	22	2.60	79.0	27.89

SLUDGE - 1972

Hg	80	.02	15.00	.92
Cd	80	0.0	8.1	1.06
Pb	80	.02	400.0	41.72
Cr	80	.2	170.0	18.4
As	2	7.6	31.4	19.50

TABLE 25

MASSACHUSETTS SEDIMENT SAMPLES
(mg/kg Dry Wt. Passing #30 Sieve)

Toxic Metal	No. of Samples	Minimum	Maximum	Mean
1971				
Hg	157	0.01	190.0	5.13
Cd	154	0.0	310.0	14.74
Pb	154	0.0	1040.0	174.13
Cr	154	1.1	3200.0	175.35
1972				
Hg	357	0.0	100.0	1.95
Cd	357	0.0	27.0	2.37
Pb	351	.5	2000.0	150.87
Cr	357	1.10	2960.0	78.67
As	357	0.0	200.0	4.56
1973				
Hg	11	.27	1.30	.60
Cd	11	1.00	7.80	3.99
Pb	11	100.0	620.0	259.55
Cr	11	1.60	22.0	12.17
As	11	3.4	15.0	7.65
1974				
Hg	8	0.0	3.0	.79
1974 (ppm)				
Hg	17	.02	20.0	1.65

levels with maximum values as high as 5.10 and 1.20 mg/l respectively. For 1972, 373 water samples were done for mercury; 382 for cadmium, chromium and lead, and 368 samples for arsenic. Lead and chromium again showed that most significant levels with maximums of 190 and 41 mg/l respectively. Table 26 shows the means and ranges for 1971 and 1972.

Conclusions

1. The water bodies sampled generally show a low degree of pollution of all toxic substances except chromium and lead which are found in excessive quantities in some sources.

2. Sediments show massive concentrations of all the toxic substances.

3. Core samples reveal large quantities of these substances, but not to the same extent as the sediments.

4. The analyses on sludges reveal the high potential which the substances have for being pollutants.

5. Both shellfish and finfish show a large contamination by these toxic substances. This trend further confirms the idea that these organisms tend to accummulate these substances from ambient conditions that possess even trace quantities.

(b) Interstate Carrier Water Supply Analysis

This is an on-going program to monitor the quality of water used on interstate carriers, e.g., buses, planes. A wide range of water quality parameters are determined including arsenic, cadmium, chromium, lead and mercury.

TABLE 26

MASSACHUSETTS WATER SAMPLES
(mg/1)

1971

Toxic Metal	No. of Samples	Minimum	Maximum	Mean
Hg	40	.00005	.015	.01265
Cd	42	0.0	.10	.02
Pb	42	0.0	5.1	.29
Cr	42	0.0	1.2	.12

1972

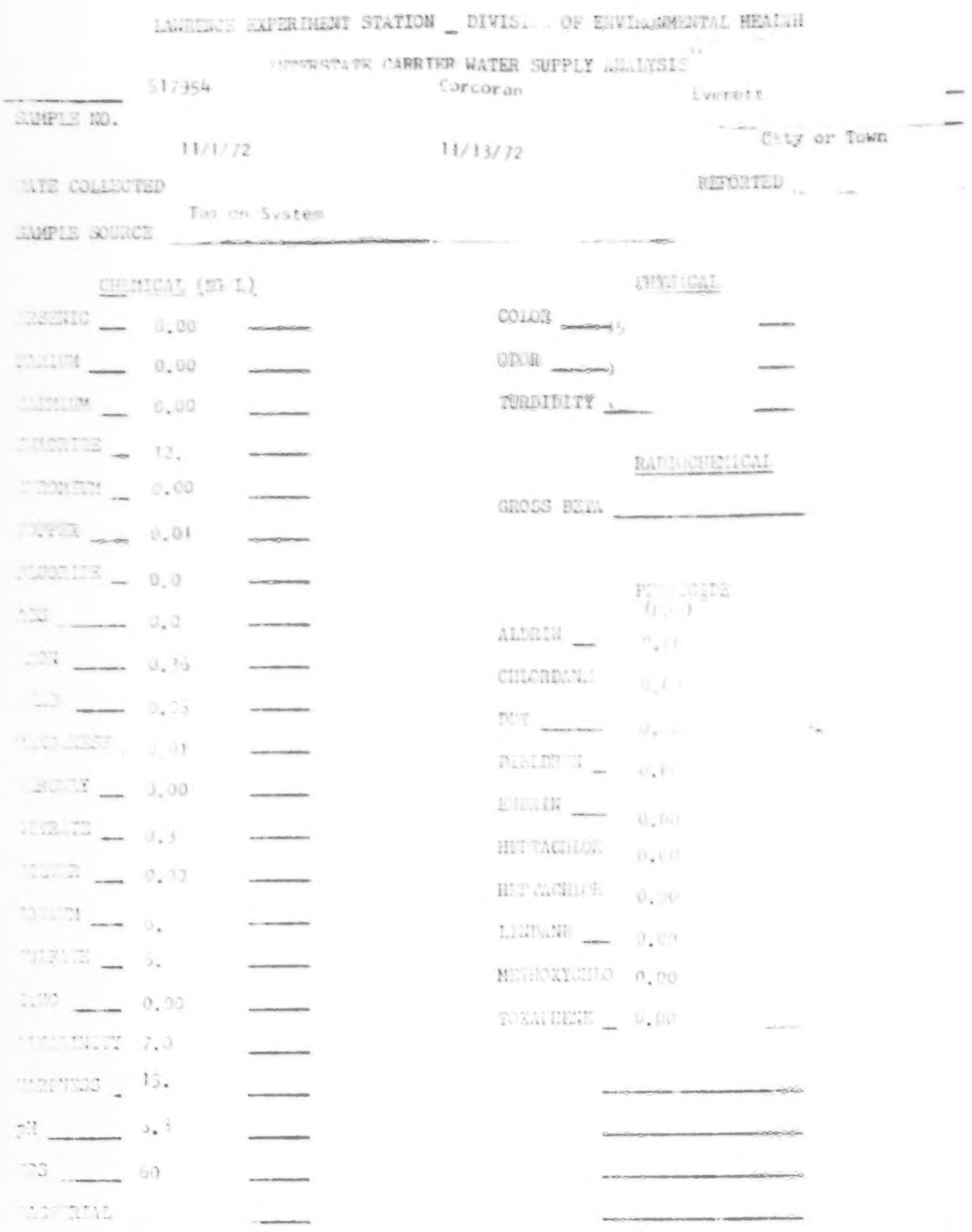
Toxic Metal	No. of Samples	Minimum	Maximum	Mean
Hg	373	.0001	.360	.0021
Cd	382	0.0	.07	.003
Pb	382	0.0	190.0	1.17
Cr	382	0.0	41.0	.24
As	368	0.0	.18	.0002

The data collected from this program consists of about 15 data sheets which represents samples collected from 15 points from various towns in Massachusetts in November 1972. Figure 41 shows the parameters for which analyses were done at the Lawrence Experiment Station. No values were detected for any of the toxic substances listed.

(c) Bottled Water Program

The Lawrence Experiment Station carried out a testing program on water from bottled water companies in the spring and summer of 1974. This was a result of the upsurge in demand for bottled water. The toxic substances tested were arsenic, cadmium, chromium, lead, and mercury. About 30 samples were collected from a cross-section of companies.

Figure 42 is an example of the data recorded for these tests. No levels of any of the above substances were detected except mercury. In the case of mercury, all samples show levels of less than 1 ppb which was the minimum level of detection. No pesticides or PCB's were detected, but varying values were reported for other water quality parameters, some of which were not consistent with limits required for public supplies.



LAWRENCE EXPERIMENT STATION _ DIVISION OF ENVIRONMENTAL HEALTH

INTERSTATE CARRIER WATER SUPPLY ANALYSIS

SAMPLE NO. 517354 Corcoran Everett

City or Town

DATE COLLECTED 11/1/72 11/13/72 REPORTED

SAMPLE SOURCE Tap on System

CHEMICAL (MG/L)

ARSENIC 0.00
BARIUM 0.00
CADMIUM 0.00
CHLORIDE 12.
CHROMIUM 0.00
COPPER 0.01
FLUORIDE 0.0
ABS 0.0
IRON 0.36
LEAD 0.05
MANGANESE 0.01
MERCURY 0.00
NITRATE 0.3
SELENIUM 0.00
SODIUM 6.
SULFATE 5.
ZINC 0.00
ALKALINITY 7.0
HARDNESS 15.
pH 5.3
TDS 60
BACTERIAL

PHYSICAL

COLOR 5
ODOR 0
TURBIDITY

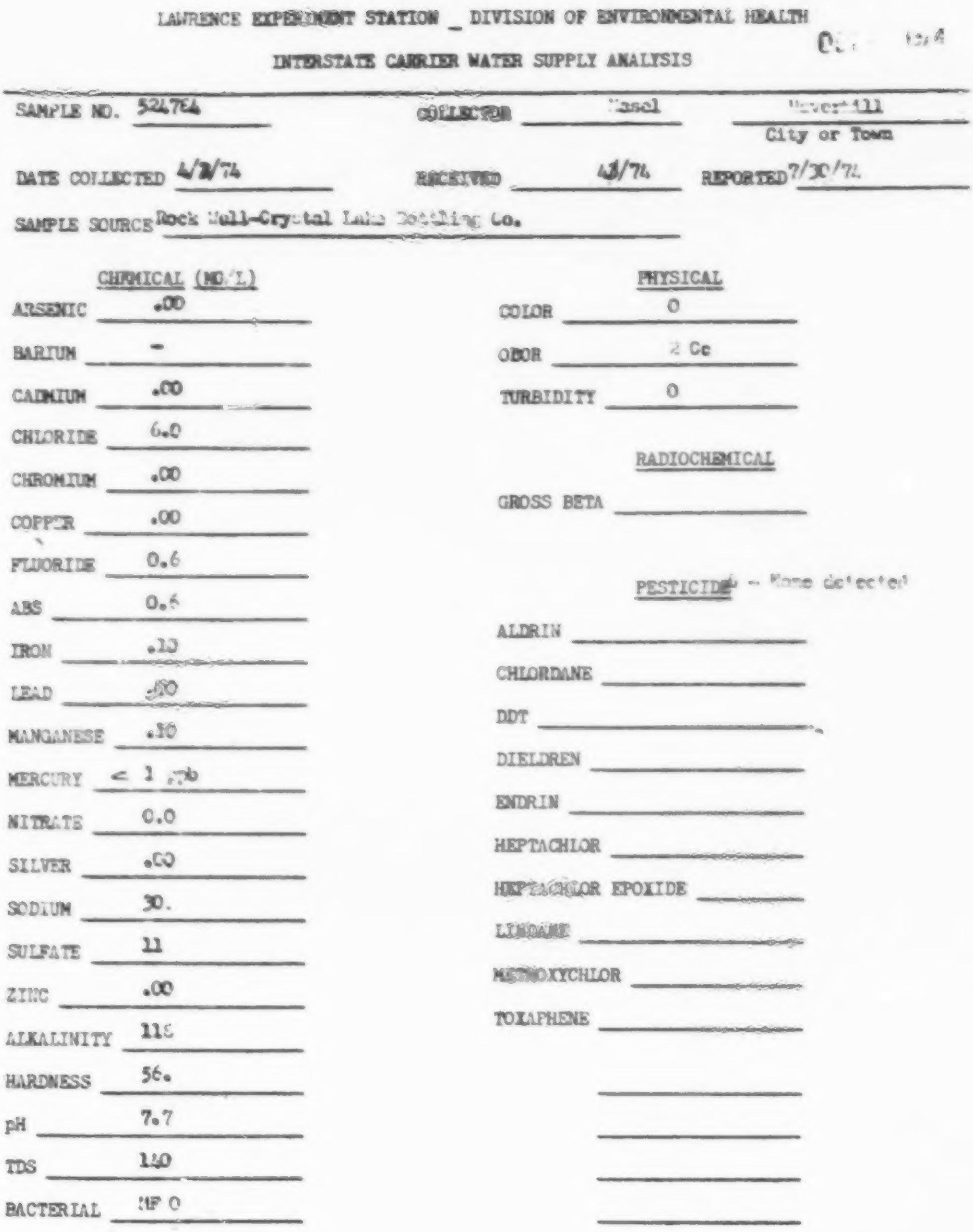
RADIOCHEMICAL

GROSS BETA

PESTICIDE
([illegible])

ALDRIN 0.00
CHLORDANE 0.00
DDT 0.00
DIELDRIN 0.00
ENDRIN 0.00
HEPTACHLOR 0.00
HEPTACHLOR 0.00
LINDANE 0.00
METHOXYCHLO 0.00
TOXAPHENE 0.00

FIGURE 41
INTERSTATE CARRIER WATER SUPPLY ANALYSIS–TAP WATER



LAWRENCE EXPERIMENT STATION _ DIVISION OF ENVIRONMENTAL HEALTH

INTERSTATE CARRIER WATER SUPPLY ANALYSIS

[illegible]

SAMPLE NO. 524784

COLLECTOR Hasel

Haverhill
City or Town

DATE COLLECTED 4/2/74

RECEIVED 4/3/74

REPORTED 7/30/74

SAMPLE SOURCE Rock Well-Crystal Lake Bottling Co.

CHEMICAL (MG/L)

ARSENIC .00
BARIUM -
CADMIUM .00
CHLORIDE 6.0
CHROMIUM .00
COPPER .00
FLUORIDE 0.6
ABS 0.6
IRON .10
LEAD .00
MANGANESE .10
MERCURY < 1 ppb
NITRATE 0.0
SILVER .00
SODIUM 30.
SULFATE 11
ZINC .00
ALKALINITY 118
HARDNESS 56.
pH 7.7
TDS 140
BACTERIAL MF 0

PHYSICAL

COLOR 0
ODOR 2 Cc
TURBIDITY 0

RADIOCHEMICAL

GROSS BETA

PESTICIDES – None detected

ALDRIN
CHLORDANE
DDT
DIELDREN
ENDRIN
HEPTACHLOR
HEPTACHLOR EPOXIDE
LINDANE
METHOXYCHLOR
TOXAPHENE

FIGURE 42
INTERSTATE CARRIER WATER SUPPLY ANALYSIS–BOTTLED WATER

THIRD QUARTER

DATA SUMMARY AND ANALYSIS

RESULTS OF DATA ANALYSIS

1.0 MISSOURI AGENCY DATA ANALYSIS

1.1 Missouri Water Supply Program

The Missouri water supply program is responsible for monitoring all drinking water sources in Missouri with the exception of Kansas City, St. Louis county, and St. Louis city. Until the acquisition of atomic absorption equipment in 1972, water analysis was limited to wet chemistry methods and none of the toxic substances of interest were monitored. In 1972, a two-year program of phase monitoring was initiated. All water supplies in the state (approximately 1,000) were analyzed once each during the period 1972-1973 for metals, including arsenic, cadmium, chromium, lead, and mercury. Of about 1,000 analysis sheets that were available, approximately only 100 report sheets showed values of constituents within detectable limits. Of the approximately 100 cases where a constituent was detected, the constituent was lead. A summary of the lead values is displayed in Table 27. The data where values were below detectable limits were not analyzed, but are available at EPA.

TABLE 27

LEAD IN MISSOURI WATER SUPPLIES (ppm)

YEAR	NO. OF SAMPLES	RANGE	MEAN
1972	66	0.001-.067	0.006
1973	9	0.01-.025	0.0139
1974	3	0.008-.02	0.0127

1.2 Missouri Clean Water Commission

The Missouri Clean Water Commission engages in a limited sampling program of certain waste water treatment facilities which have industrial effluents (mostly from plating operations) tied into the sanitation systems. The effluent was usually pretreated by the industry, then further treated by the municipal plant, and then the sample was taken of the plant effluent. Since 1972 when the sampling began, cadmium, chromium, and lead were among the metals screened for, and in the great majority of cases, no metals were detected. If the presence of metals was qualitatively determined by rudimentary screening, then those samples were taken to the Air Conservation Commission laboratory for atomic absorption analysis. Data was provided for samples analyzed at the Air Conservation Commission, and these included 34 plants from 1972 to the present. Of the 34 samples analyzed for cadmium, chromium and lead, 19 total values were within the detectable limits of the method. Table 28 shows the values obtained from analyzing this data.

TABLE 28

TOXIC SUBSTANCES IN MISSOURI SEWAGE (ppm)

TOXIC SUBSTANCE	NO. OF SAMPLES	RANGE	MEAN
	1972		
LEAD	6*	0 - 15000	2500
CADMIUM	6*	0 - 1700	283.3
CHROMIUM	6*	0 - 700	116.6
	1973		
LEAD	21	0 - 0	0
CADMIUM	21	0 - 45	8.19
CHROMIUM	21	0 - 3440	421.8
	1974		
LEAD	8	0 - 0	0
CADMIUM	8	0 - 27	5.37
CHROMIUM	8	0 - 315	64.37

---

*In each case, five values were zero.

1.3 Missouri Air Conservation Commission

The state of Missouri operates an air monitoring network that is comprised of 36 total sampling sites. A variety of sampling techniques and instruments are used at these sites, such as sulfation plates, multi gas bubblers, Aisi tape, etc. MITRE requested the data recorded from the high volume particulate sampling and also from the settleable particulate sampling since the trace metal analysis for these sampling techniques yielded data on two of the toxic substances of interest to OTS, lead and cadmium.

The high volume sampling is conducted at 22 of the 36 total sampling sites. The sampling time was based on a 24 hour or "daily" sampling period. This daily data was transferred to SAROAD daily data forms for key punching, and then processed by a MITRE statistical program to produce data by site and constituent for the following parameters:

- Number of samples
- Maximum
- Minimum
- Average
- Standard Deviation

A sample of the Missouri Hi-Vol data and the SAROAD daily data form are shown in Figures 43 and 44.

The final data printouts displaying the Hi-Vol data in final format appear in Appendix A.

SUSPENDED PARTICULATE

Trace Metal Analysis for Lead, Cadmium, Iron and Copper

[illegible]	Location	Date(s) On	Hrs. Run	Wt. Sample (grams)	Air Flow (cu ft/min)	Wt. Element in Sample Pb	Cd	Fe	Cu	% Element in Sample Pb	Cd	Fe	Cu	µg/m³ Air of Element Pb	Cd	Fe	Cu
7	Columbia	11-5-72 11-12-72	48	.1185	46.0	.0045	.000012	.0017	.00026	3.8	.010	1.43	.22	1.2	.003	.5	.07
[illegible]	Columbia	11-23-72	24	.0353	47.0	.0010	.000009	.0014	.00016	1.3	.026	3.97	.45	.5	.005	.7	.08
7	Columbia	11-29-72	24	.0862	45.0	.0018	.000007	.0018	.00016	2.1	.008	2.09	.19	1.0	.004	1.0	.08
42	Glover	9-10-72	24	.0273	51.0	.0034	.000019	.0023	.00102	12.5	.070	8.43	3.74	1.6	.010	1.1	.48
12	Glover	10-6-72 10-7-72 10-13-72 10-14-72	96	.5445	41.5	.0925	.000950	.0925	.00483	17.0	.174	10.92	.89	13.7	.140	1.5	.71
[illegible]	Glover	10-20-72 10-27-72 11-4-72	72	.3195	50.5	.0298	.000120	.0107	.00328	9.3	.038	3.35	1.03	4.3	.019	1.7	[illegible]
43	Glover	11-5-72 11-12-72	39	.1343	53.5	.0340	.000250	.0036	.00196	25.3	.186	2.68	1.46	9.6	.071	1.0	.55
48	Glover	11-16-72	24	.0611	53.5	.0019	.000033	.0020	.00119	3.1	.054	3.27	1.95	.9	.015	.9	.57

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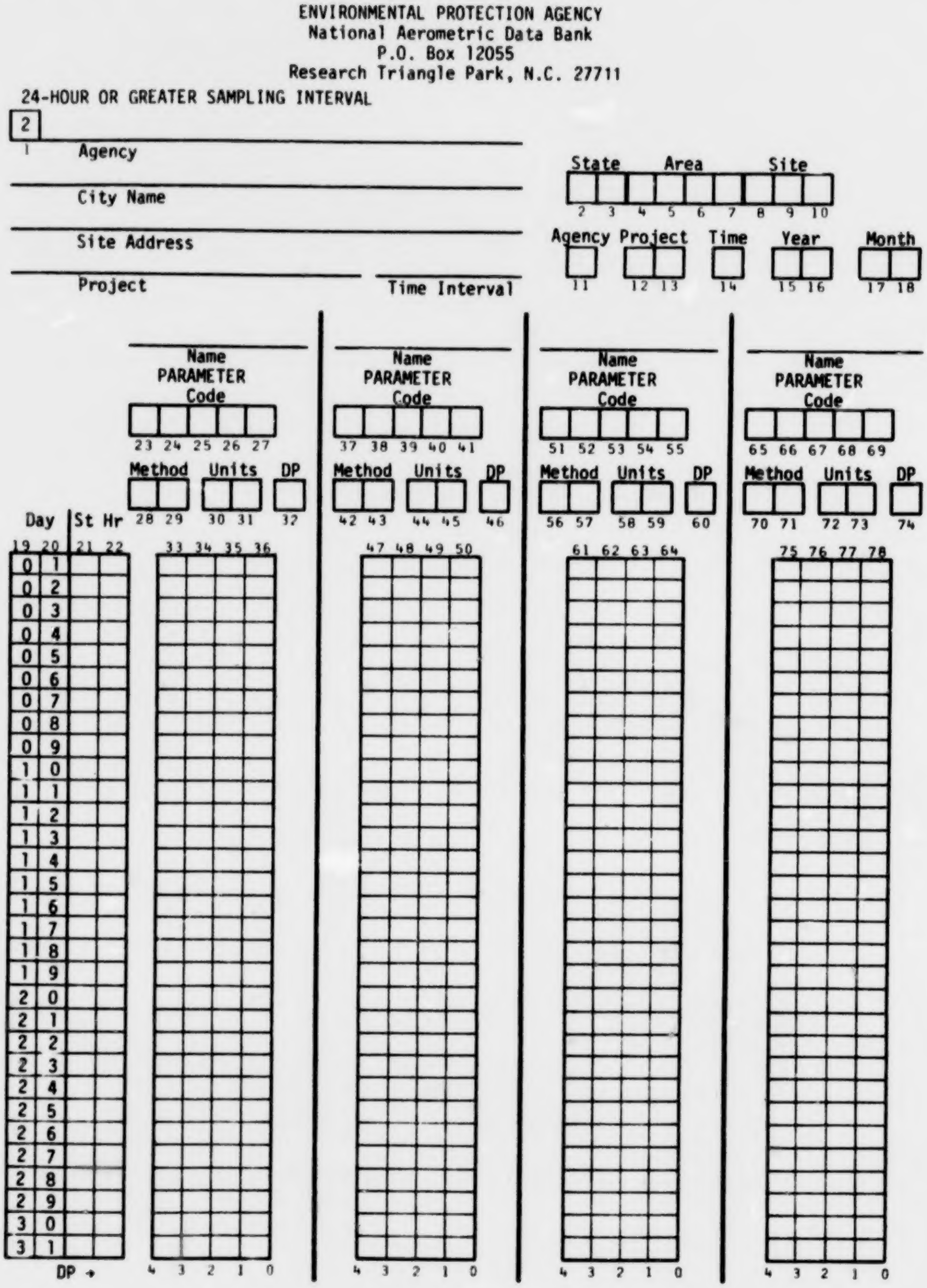
FIGURE 43
SAMPLE OF MISSOURI HI-VOL DATA



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National Aerometric Data Bank
P.O. Box 12055
Research Triangle Park, N.C. 27711

24-HOUR OR GREATER SAMPLING INTERVAL

2
1

Agency

City Name

Site Address

Project

Time Interval

State Area Site
2 3 4 5 6 7 8 9 10

Agency 11
Project 12 13
Time 14
Year 15 16
Month 17 18

Name
PARAMETER
Code
23 24 25 26 27
Method 28 29
Units 30 31
DP 32
33 34 35 36

Name
PARAMETER
Code
37 38 39 40 41
Method 42 43
Units 44 45
DP 46
47 48 49 50

Name
PARAMETER
Code
51 52 53 54 55
Method 56 57
Units 58 59
DP 60
61 62 63 64

Name
PARAMETER
Code
65 66 67 68 69
Method 70 71
Units 72 73
DP 74
75 76 77 78

Day 19 20
St Hr 21 22

01
02
03
04
05
06
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08
09
10
11
12
13
14
15
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17
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26
27
28
29
30
31

DP → 4 3 2 1 0 4 3 2 1 0 4 3 2 1 0 4 3 2 1 0

FIGURE 44
SAROAD DAILY DATA FORM

MITRE also received settleable particulate data from the state sampling network. One portion of the data involved lead determination of the samples for the years 1971 and 1972. The remaining portion dealt with trace metal analysis of the settleable particulate. This produced data on lead and cadmium for the year 1971. These two sets of data were processed manually for the following parameters:

- Number of samples
- Maximum
- Minimum
- Average

An example of the settleable particulate data is shown in Figure 45 Tables 29, 30 and 31 contain the results of the settleable particulate data analysis.

1.4 St. Louis County Air Sampling Network

St. Louis County operates a sampling network similar to the state of Missouri in that it also employs a variety of sampling techniques and instruments. Sampling is conducted at a total of 12 sampling sites, 11 of which utilize high volume particulate samplers. MITRE received air data that was in monthly composite form. Lead and cadmium data for the years 1971-1974 was extracted from the County data and coded on SAROAD composite data forms. This data was then key punched and processed in the same format as the state air data. Figure 46 shows an example of the St. Louis County air data, and Figure 47 shows a SAROAD composite data form.

SETTLEABLE PARTICULATES

Lead Analysis

October, 1972

Site #	Location	Exposure Period	Wt. Sample (grams)	Wt. Lead (grams)	% Lead in Sample	Lead Values In Tons/Mile^2/30 Day
4	Joplin	9-30-72 to 10-30-72	.2035	.00020	.09	.020
11	Herculaneum	9-27-72 to 11-3-72	.1483	.00871	5.87	.769
22	Ironton	9-26-72 to 11-2-72	.1095	.00019	.17	.015
24	Taum Sauk	9-26-72 to 11-2-72	.0645	.00007	.11	.006
42	Glover	9-26-72 to 11-2-72	.5532	.00358	.65	.290
43	Glover	9-26-72 to 11-2-72	.1233	.01132	9.18	.918
54	Galena	10-4-72 to 11-6-72	.0610	.00030	.49	.027
504	Glover	9-26-72 to 11-2-72	.0941	.00030	.32	.024

FIGURE 45
MISSOURI SETTLEABLE PARTICULATE DATA

TABLE 29

LEAD DETERMINATION OF DUSTFALL ANALYSIS
MISSOURI AIR CONSERVATION COMMISSION SAMPLING NETWORK

(Tons/Mile^2/30 Days)
1971

SITE	LOCATION	# MONTHLY SAMPLES	MIN.	MAX.	MEAN
4A	Joplin	2	.01	.015	.0125
11	Herculaneum	3	.32	1.67	1.097
22	Ironton	2	.009	.05	.0295
42	Glover	3	.26	.47	.356
43	Glover	3	.51	.99	.713
54	Galena	2	.003	.03	.0165
57	Pilot Knob	3	.01	.03	.0233
19	Pevely	1	.12	.12	.12
24	Taum Sauk	1	.02	.02	.02

TABLE 30

LEAD DETERMINATION OF DUSTFALL ANALYSIS MISSOURI AIR CONSERVATION COMMISSION SAMPLING NETWORK

(Tons/Mile^2/30 Days)
1972

SITE	LOCATION	# MONTHLY SAMPLES	MIN.	MAX.	MEAN
11	Herculaneum	12	.11	3.16	.9205
19	Pevely	8	.06	.34	.1522
22	Ironton	11	.014	.07	.039
24	Taum Sauk	10	.002	.06	.0197
42	Glover (Govero)	12	.26	1.29	.4849
43	Glover (Sutton)	12	1.29	2.1	1.302
54	Galena	12	.01	.07	.0276
57	Pilot Knob	4	.01	.04	.025
4A	Joplin	3	.01	.06	.04
4	Joplin	7	.02	.05	.0327

TABLE 31
SETTLEABLE PARTICULATE TRACE METAL ANALYSIS FOR LEAD AND CADMIUM MISSOURI AIR CONSERVATION COMMISSION SAMPLING NETWORK

(Tons/Mile^2/30 Days)
1971

SITE NO.	LOCATION NAME	NUMBER OF MONTHLY SAMPLES	LEAD			CADMIUM		
			MIN.	MAX.	MEAN	MIN.	MAX.	MEAN
7	Columbia	10	.01	.02	.0123	.0001	.006	.0009
6	Columbia	2	.01	.01	.01	.0003	.0003	.0003
11	Herculaneum	10	.13	.81	.352	.004	.024	.011
19	Pevely	6	.004	.11	.049	.0001	.003	.0017
22	Ironton	9	.01	.04	.0189	.0001	.001	.0006
41	STE Genevieve	9	.01	.03	.02	.0008	.005	.0023
49	New Madrid	4	.003	.01	.0065	.0001	.002	.0011
53	Maryville	3	.002	.01	.0071	.0001	.005	.0011
43	Glover	5	.25	1.20	.584	.014	.031	.022
1	St. Joseph	3	.01	.01	.01	.0003	.0004	.0003
14	Weldon Springs	3	.01	.03	.0167	.001	.004	.003
18	West Alton	3	.002	.07	.0273	.0002	.001	.0005
38	St. Charles	3	.001	.01	.0007	.0001	.0004	.0003
67	Jefferson City	3	.002	.01	.0053	.0001	.001	.0005
106	Raytown	2	.01	.01	.01	.0001	.0004	.00025
45	Mexico	2	.005	.01	.0075	.0002	.0003	.00025
28	Mexico	2	.003	.01	.0065	.0001	.0002	.00015
58	Fulton	2	.001	.002	.0015	.0002	.0002	.0002
32	Sikeston	3	.002	.004	.0033	.0002	.0003	.00023
36	Poplar Bluff	2	.003	.004	.0035	.0001	.0002	.00015

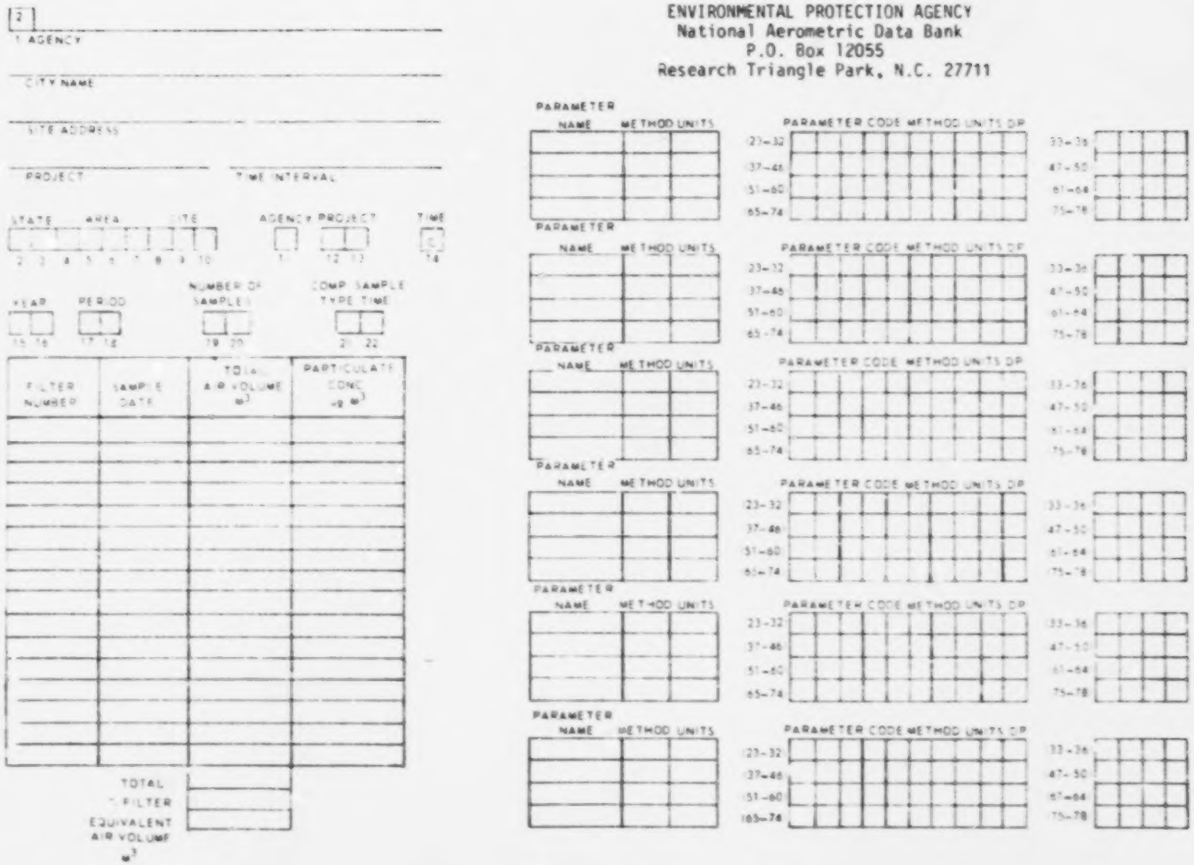
DIVISION OF LABORATORIES
ST. LOUIS COUNTY HEALTH DEPARTMENT

Trace Metals Analyses
(ug/m^3)

June, 1972

	Northland	Sinks	Chambers	SLCHD	Mt. St. Rose	Harold	ACIC	Trailer (T-4)	St. Ann (T-7)	State Farm (T-8)
Fe	1.26	1.16	1.59	0.99	1.66	1.28	2.59	1.20	1.36	1.35
Pb	1.89	0.56	1.13	2.88	0.81	0.96	0.83	2.56	0.86	0.78
Zr	0.79	0.17	0.42	0.44	0.59	0.09	0.21	0.76	0.54	0.22
Cu	0.003	0.111	0.000	0.000	0.033	0.000	0.000	0.000	0.021	0.386
Mn	0.080	0.055	0.082	0.034	0.049	0.048	0.061	0.028	0.052	0.068
Cd	0.012	0.007	0.002	0.016	0.009	0.010	0.004	0.063	0.002	0.002

FIGURE 46
ST. LOUIS COUNTY AIR DATA



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2
1 AGENCY
CITY NAME
SITE ADDRESS
PROJECT
TIME INTERVAL

STATE 2 3 AREA 4 5 6 7 SITE 8 9 10
AGENCY 11
PROJECT 12 13
TIME C 14
YEAR 15 16
PERIOD 17 18
NUMBER OF SAMPLES 19 20
COMP SAMPLE TYPE TIME 21 22

FILTER NUMBER	SAMPLE DATE	TOTAL AIR VOLUME m^3	PARTICULATE CONC $\mu g/m^3$

TOTAL FILTER EQUIVALENT AIR VOLUME m^3

PARAMETER NAME METHOD UNITS
PARAMETER CODE METHOD UNITS DP
23–32
37–46
51–60
65–74
33–36
47–50
61–64
75–78

PARAMETER NAME METHOD UNITS
PARAMETER CODE METHOD UNITS DP
23–32
37–46
51–60
65–74
33–36
47–50
61–64
75–78

PARAMETER NAME METHOD UNITS
PARAMETER CODE METHOD UNITS DP
23–32
37–46
51–60
65–74
33–36
47–50
61–64
75–78

PARAMETER NAME METHOD UNITS
PARAMETER CODE METHOD UNITS DP
23–32
37–46
51–60
65–74
33–36
47–50
61–64
75–78

PARAMETER NAME METHOD UNITS
PARAMETER CODE METHOD UNITS DP
23–32
37–46
51–60
65–74
33–36
47–50
61–64
75–78

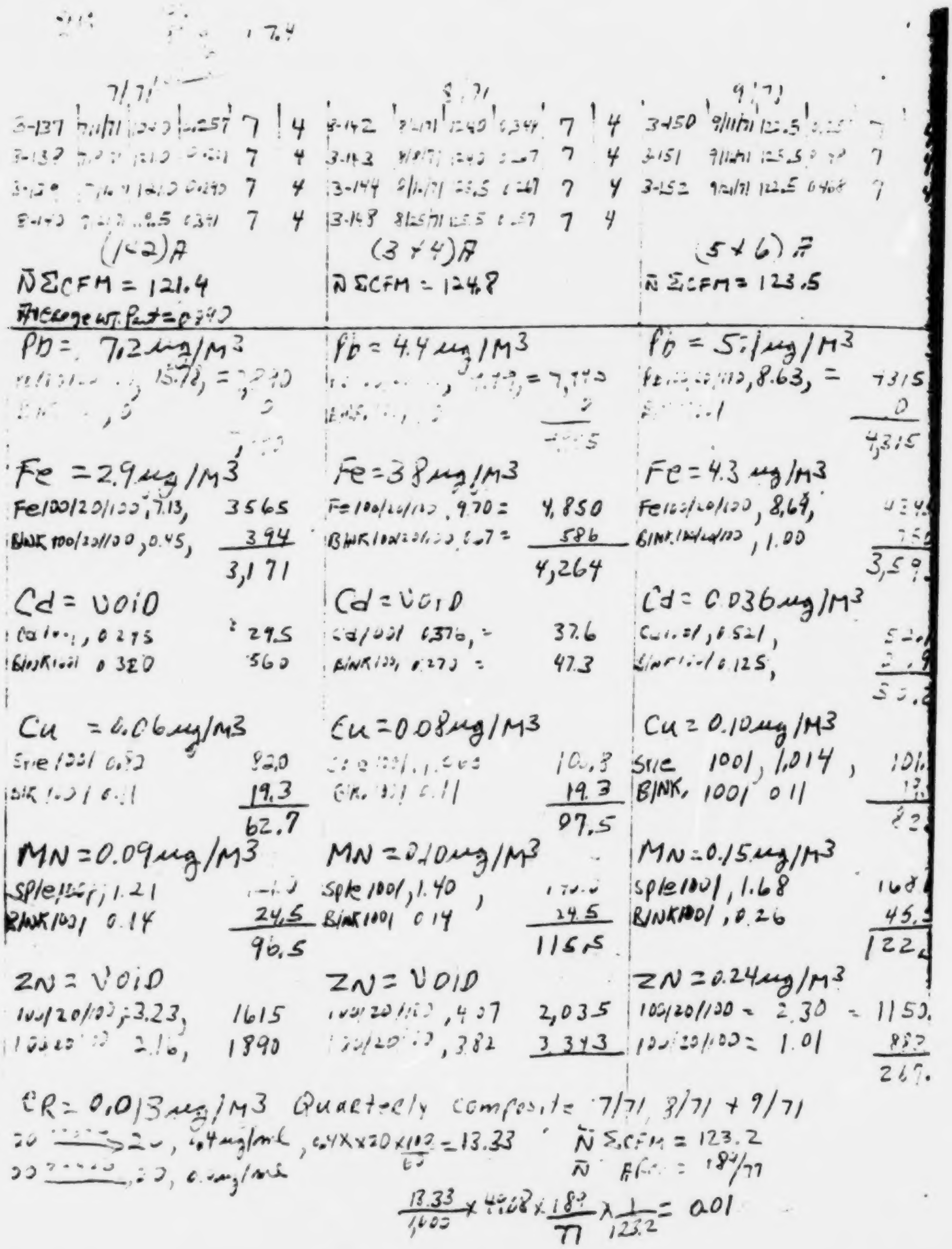
PARAMETER NAME METHOD UNITS
PARAMETER CODE METHOD UNITS DP
23–32
37–46
51–60
65–74
33–36
47–50
61–64
75–78

FIGURE 47
SAROAD COMPOSITE DATA FORM

The results of the St. Louis County data analyses appear in Appendix A.

1.5 St. Louis City Air Sampling Network

The city of St. Louis operates an air sampling network similar to the county and state networks. The city network is comprised of 37 total sampling sites, 10 of which conduct high volume particulate sampling. MITRE was supplied with lead, cadmium, and chromium data for the years 1970–1973. The greater majority of this data was in monthly composite form, although a small portion of the chromium data was in quarterly composite form. This data was transferred to SAROAD composite data forms (Figure 47), keypunched, and processed with the MITRE statistical program to produce the desired data values and parameters. An example of the St. Louis city data appears as Figure 48, and the resulting data in final printout format is shown in Appendix A.



7/71

3-137 7/1/71 [illegible] 7 4
3-138 [illegible] 7 4
3-139 [illegible] 7 4
3-140 [illegible] 7 4

(1+2)A

$\bar{N}\,\Sigma$CFM = 121.4

Average wt. Part = [illegible]

Pb = 7.2 μg/M^3

[illegible], 15.78, = [illegible]

Fe = 2.9 μg/M^3

Fe100/20/100, 7.13, 3565

BLNK 100/20/100, 0.45, 394

3,171

Cd = VOID

Cd 100[illegible], 0 295 29.5

BLNK 1001 0 320 560

Cu = 0.06 μg/M^3

Sple 1001 0.82 82.0

BLNK 1001 0.11 19.3

62.7

MN = 0.09 μg/M^3

Sple 1001, 1.21 121.0

BLNK 1001 0.14 24.5

96.5

ZN = VOID

100/20/100, 3.23, 1615

100/20/100 2.16, 1890

8/71

3-142 8/2/71 124.0 0.344 7 4
3-143 8/8/71 124.0 [illegible] 7 4
3-144 8/1./71 123.5 [illegible] 7 4
3-148 8/25/71 125.5 [illegible] 7 4

(3+4)A

$\bar{N}\,\Sigma$CFM = 124.8

Pb = 4.4 μg/M^3

[illegible], [illegible], = 7,770

Fe = 3.8 μg/M^3

Fe 100/20/100, 9.70 = 4,850

BLNK 100/20/100, 1.17 = 586

4,264

Cd = VOID

Cd/1001 0.376, = 37.6

BLNK 1001, 0.273 = 47.3

Cu = 0.08 μg/M^3

[illegible] 1001, 1.[illegible] 100.8

BLNK 1001 0.11 19.3

97.5

MN = 0.10 μg/M^3

Sple 1001, 1.40, 140.0

BLNK 1001 0.14 24.5

115.5

ZN = VOID

100/20/100, 4.07 2,035

100/20/100, 3.82 3 343

9/71

3-150 9/11/71 125.5 [illegible] 7
3-151 9/11/71 125.5 [illegible] 7
3-152 9/2/71 122.5 0.468 7

(5+6)A

$\bar{N}\,\Sigma$CFM = 123.5

Pb = 5.1 μg/M^3

Fe 100/20/100, 8.63, = 4315

BLNK [illegible] 0

4,315

Fe = 4.3 μg/M^3

Fe100/20/100, 8.69,

BLNK 100/20/100, 1.00

3,59

Cd = 0.036 μg/M^3

Cd 1001, 0.521,

BLNK 1001 0.125,

Cu = 0.10 μg/M^3

Sple 1001, 1.014, 101.

BLNK, 1001 0.11

MN = 0.15 μg/M^3

Sple 1001, 1.68 168

BLNK 1001, 0.26 45.

122

ZN = 0.24 μg/M^3

100/20/100 = 2.30 = 1150.

100/20/100 = 1.01 882

267.

CR = 0.013 μg/M3 Quarterly composite 7/71, 8/71 + 9/71

20 [illegible] → 20, 0.4 μg/ml, 0.4 × 20 × 100/60 = 13.33

20 [illegible], 20, 0. μg/ml

$\bar{N}\,\Sigma$CFM = 123.2

$\bar{N}$ Aff = 184/77

$\frac{13.33}{1,000} \times 4,008 \times \frac{184}{77} \times \frac{1}{123.2} = 0.01$

FIGURE 48
ST. LOUIS CITY AIR DATA

2.0 WASHINGTON AGENCY DATA ANALYSIS

2.1 Department of Fisheries -- Management and Research Division

In 1972, sediment samples were taken from the Olympia harbor by the above-mentioned agency. A preliminary evaluation was made for two toxic substances, lead and chromium. Ten stations were sampled. The values obtained for chromium varied between 30 and 46 mg/gm with a mean of 39 mg/gm. There were no finite values for lead, although it was detected between less than 28 and less than 84 mg/gm dry weight for the set of 10 samples.

2.1.1 Pacific Oyster Embryo Bioassays of Bottom Sediment from Washington Water

This study was a short investigation conducted between 14 June and 10 August 1973. It is a phase of the research program instituted between 1971 and 1973 to evaluate the effects of channel dredging and the disposal of the dredged spoil on the local marine environment. It involved an evaluation of bottom sediments from several locations in Washington using a Pacific oyster embryo bioassay procedure.

The bioassay technique utilized sediments from the chosen areas to contaminate larvae of veliger oysters over a 29-hour period under controlled laboratory conditions. After that time, the larvae were assessed as normal if they had shells, and as abnormal if they did not. The basis of this criterion was apparently the adverse effect of components of the sediment on the unshelled larvae.

Subsequent chemical analysis were performed on the sediments for chromium, lead, mercury and PCB's.

The results are shown in Table 32 which also shows the locations from which the sediments were taken. The concentrations in the toxic substances do not clearly correlate with the degree of abnormal or normal oysters. For example, it was observed that 0.2 g/l (dry weight) of sediments from Gray's harbor composite samples caused a significant increase in percentage of abnormality, while greater than 30 percent of sediments from Bud Inlet was required to give the same effect. Apparently, the quantity of sediments needed will be determined by the concentration of the constituent toxic substances and also probably on the synergistic adverse impacts on the oyster larvae. These larvae appear to be very sensitive biological monitors of the quality of bottom sediments and the method shows promise in subsequent efforts to evaluate sediments.

2.2 Department of Game

2.2.1 Effect of Some Insecticide Sprays in Washington State

A report was received on insecticides used in orchards throughout the state of Washington. No PCB's were included or identified.

Studies on pesticides and insecticides conducted in the state of Washington were mostly for DDT. No analyses were done for PCB's. Samples of fatty tissue were taken from birds, deers, elk, wild goats, etc.

TABLE 32

SEDIMENT ANALYSIS FOR TOXIC SUBSTANCES IN STATE OF WASHINGTON

(mg/kg)

AREA	TOXIC SUBSTANCE	NO. OF SAMPLES	RANGE	MEAN
Grays Harbor	Cr	3	26-27	26.3
	Pb	3	18-23	20.0
	Hg	3	1.3-6.3	3.0
	PCB 1260	3	0.0005-0.0005	0.0005
	1248 & 1254	3	0.048-.300	0.134
Druwamish	Cr	3	20-67	45.3
	Pb	3	35-340	145
	Hg	3	1.0-1.8	1.4
	PCB 1260	3	trace-0.0005	
	1248 & 1254		1.6-6.0	3.4
Bud Inlet	Cr	1	27	27
	Pb	1	14	14
	Hg	1	3.5	3.5
	PCB 1260	1	0.0005	0.0005
	1248 & 1254	1	0.031	0.031
Oro Bay	Cr	1	26	26
	Pb	1	17	17
	Hg	1	1.4	1.4
	PCB 1260	1	0.0005	0.0005
	1248 & 1254	1	0.025	0.025
Billingham	Cr	3	32-47	38
	Pb	3	28-71	44.3
	Hg	3	2.4-78	4.4
	PCB 1260	3	0.0005-0.0005	0.0005-0.0005
	1248 & 1254	3	0.100-.148	1.2

TABLE 32 (continued)

AREA	TOXIC SUBSTANCE	NO. OF SAMPLES	RANGE	MEAN
Eld Inlet	Cr	1	33	33
	Pb		N.D.	-
	Hg	1	0.9	0.9
	PCB 1260 1248 & 1254	1	20	20
Liberty Bay	Cr	1	26	26
	Pb	1	15	15
	Hg	1	1.2	1.2
	PCB 1260	1	0.5	0.5
	1248 & 1254	1	37	37
Pt. Whitney Lagoon	Cr	1	31	31
	Pb	1	7	7
	Hg	1	2.7	2.7
	PCB 1260	1	0.5	0.5
	1248 & 1254	1	1.0	1.0

N.D. None determined

2.2.2 Lead Shot in Washington Waterfowl 1973-74 Hunting Season

Collection of waterfowl gizzards to determine the incidence of ingested lead shot in Washington was initiated in November 1973 in three major waterfowl hunting areas. No quantitative analysis was performed, but the X-ray photographs revealed that only 4 percent of the 692 gizzards contained lead shots. This would represent a loss of 1 to 5 birds per thousand, and was slightly lower than the 4.9 percent loss recorded for earlier periods.

2.2.3 Mercury in Washington Wildlife

Thirty-seven wild pheasants were collected from birds killed on the road and from birds collected from eastern Washington farming areas. Results from analyses showed that only five birds exceeded the 0.5 ppm level of mercury in liver tissue and only one exceeded that value in breast tissue. One pheasant (road-killed) showed 0.75 ppm in the liver but only a 0.046 ppm in breast tissue. Another bird collected showed 0.72 ppm in the liver and 0.117 ppm in the breast. Only one bird had an excessive mercury concentration in both the liver and the breast, viz: 4.84 and 4.61 ppm respectively. The source of this high level of mercury was not determined.

In another survey, analyses were done on birds (control) exposed to mercury-treated grains, as well as to birds fed on mixture of such grains and untreated grains, and birds fed only on treated grains. The control birds showed a similarly low level as found in the statewide survey of pheasants collected. Those fed the mixture of grains survived some minor losses and their mercury levels were slightly higher in both liver and breast tissue than in the control group. Out of eleven birds tested one had a 0.71 ppm and one had 0.60 ppm. Those fed only mercury-treated grain generally refused to feed and most died of starvation. Thirteen birds of that group were tested and four had over 1 ppm in liver tissue, with a high of 2.65 ppm. Two exceeded 0.5 ppm in breast tissue and the highest value was 0.75 ppm.

Five band-tailed pigeons were killed near two fields seeded with mercury-treated grains, and their liver and breast tissue were analyzed. The liver generally showed high levels, but the breast tissue was all less than 0.5 ppm. The highest value was 5.32 ppm in the liver and 0.40 in the breast. This sample of pigeons seemed to have had more than an average exposure to mercury-treated grains.

The survey showed that mercury contamination in upland birds is not as serious a problem as was anticipated. The birds' apparent refusal to consume treated grain was a positive factor. The public health was not thought to be endangered and there was no impelling justification for a hunting closure.

2.3 Department of Ecology

The department made an inventory of industrial and hazardous waste in the state. The program started in April 1973 and was culminated in May 1974. Of the 600 firms contacted 450 completed reports for the inventory. The following table shows the broad categories of industries and the type of hazardous and toxic wastes produced.

TABLE 33

CATEGORIES OF INDUSTRIAL WASTE IN WASHINGTON

Industry		Chemicals or Toxic Substances
1. Paper and Allied Products	-	Hg sludges
2. Chemicals and Allied Products	-	Pesticide (PCB's), other chemicals
3. Petroleum Refining	-	Pb sludges
4. Primary Metal Industries	-	Cyanide
5. Fabricated Metal Products	-	Plating sludges
6. Machinery	-	Cyanide

No analytical/chemical determinations were done. Only qualitative assessments which classify sources of wastes were conducted. This will enable the development of systematic programs for handling and disposing of such waste.

2.4 Department of Social and Health Services, Office of Environmental Health Programs, Tacoma Smelter Study

The monitoring program for the Tacoma smelter is by far the main focus of activity for the Office of Environmental Health programs, as well as for most other environmental agencies in Washington. Terrence Strong, Section Head of the Radiation, Chemical and Physical Hazards Section of the Office of Environmental Health programs has been involved mainly with the analysis of potential health effects of the arsenic, lead, and cadmium emissions from the smelter. He was able to provide data on levels of these materials in human hair, urine, and blood; and in soil and the air near the smelter. Table 34 shows a summary of multi-media data received from the Tacoma smelter study. It is interesting to note the high values obtained for arsenic in household dusts, where values ranged from 23.4 ppm to 427.1 ppm with an average of 191.47. High levels of arsenic and lead were found in soil in the Tacoma smelter area with mean values of 119.04 ppm and 180 ppm respectively. Arsenic levels in blood in 1972 were also high with a mean value of 116 μg/100 ml.

Messrs. Terrence Strong and Samuel Milham, Jr., published tentative findings in Environmental Science, Volume 7, Number 2 in April 1974. The findings indicate that children living near the smelter in Tacoma had increased levels of arsenic in hair and urine. The level in the urine was found to be inversely related to the distance of the residences from the smelter stack, and this was also true for the

TABLE 34

TACOMA SMELTER STUDY

SUMMARY OF MULTI-MEDIA DATA

TOXIC SUBSTANCES	DATE SAMPLED	NO. OF SAMPLES	MEDIA	UNIT OF MEASUREMENT	MIN	MAX	MEAN
As	1972	178	Urine	ppm	.01	.58	.08
As	1973	312	Urine	ppm	.01	.47	.07
As	1974	224	Urine	ppm	.01	.68	.08
As	1974	9	Household Dusts	ppm	23.4	427.1	191.47
As	1972	7	Blood	μg/100 ml	10	330	116
As	1973	12	Hair	ppm	6	104	64
As	1970	4	Water	ppm	.11	4.9	2.36
As	1970	9	Water	mg/l	.01	6.7	1.76
As	----	31	Soil	ppm	1	797	119.04
Pb	1970	4	Water	ppm	.40	4.6	2.55
Pb	1970	6	Water	mg/l	.2	7	2.5
Pb	----	31	Soil	ppm	18	692	180
Pb	1972	18	Urine	μg/l	10	50	23
Pb	----	199	Blood	μg/100 ml	9	68	27
Hg	----	5	Soil	ppm	2	10	6
Cd	----	5	Soil	ppm	4	16	9

concentration in vacuum-cleaner dust. The arsenic level in urine also varied with distance from the smelter, and there was an indication that inhalation was the likely exposure medium. The urinary level of arsenic also showed an inverse relationship with age, with younger children having higher levels consistently.

Another conclusion from the article was that the death record analysis showed an increased incidence of respiratory cancer in men working in the smelter. Since the published data on arsenic levels in the urine of men working in the smelter is shown to be similar to residents in the vicinity of the smelter, it was felt that the community surrounding the smelter might be exposed to an increased risk of cancer.

The management of the smelter is reported to be very cooperative in supplying data throughout the survey, and has been responsive to the necessity of reducing emissions from the stacks. A state standard for arsenic emission was adopted after six months of negotiation following a public hearing of the Puget Sound Air Pollution Control Board. The standard simply states that no visible emissions of arsenic dusts or smoke shall be allowed, and that the best available technology shall be employed. It is not clear if the standard will be effective in reducing arsenic levels in the environment. Monitoring of the children in the study will continue and it is planned to expand the program to include other heavy metals in the atmosphere surrounding the smelter.

MITRE was informed during the Washington contact meeting that the Department of Social and Health Services is currently in the process of compiling and analyzing data for the Tacoma smelter study, and that a final analysis report will be forthcoming. The report was not received at the time the final report was prepared.

2.5 City of Tacoma - Department of Public Utilities - Water Division

MITRE received water analysis data for surface water and ground water from the city of Tacoma. Table 35 shows the results of the data calculations. The surface water that was sampled came from the Green River headworks, some thirty miles east of Tacoma. The ground water was taken from wells within the city limits of Tacoma. The values that were utilized to get the numbers displayed in Table 35 were from the year 1968 to the year 1974.

TABLE 35

CITY OF TACOMA - WATER ANALYSIS IN PPM

SURFACE WATER					GROUND WATER				
CONSTITUENT	NO. OF SAMPLES	RANGE	MEAN	STD. DEV.	CONSTITUENT	NO. OF SAMPLES	RANGE	MEAN	STD. DEV.
Arsenic	10	0-.01	.0027	.0035	Arsenic	10	0-.01	.0018	.0032
Cadmium	10	0-.01	.0035	.0041	Cadmium	10	0-.01	.0115	.0308
Chromium	10	0-.01	.001	.0031	Chromium	10	0-.01	.017	.0319
Lead	10	0-0.02	.0105	.0082	Lead	10	0-.05	.01	.0002
Mercury	10	0-.005	.0006	.005	Mercury	10	0-.01	.002	.004

3.0 GEORGIA AGENCY DATA ANALYSIS

3.1 Georgia Water Quality Control Board

In May 1970 the U.S. Department of the Interior expressed concern to the Georgia Water Quality Control Board (GWQCB) about the mercury content of effluents leaving chlorine and caustic soda manufacturing plants. Samples of wastes from these plants were collected and analyzed for mercury. The samples revealed a significant amount of mercury ranging from 8 to 420 μg/g, which was in excess of the US-FDA limit of 0.5 μg/g. Consequently, in July 1970, a cooperative program was initiated between two agencies to investigate mercury concentration in fish and other aquatic organisms.

The first phase of the survey in Georgia dealt with determining the mercury levels in waste discharges from industries manufacturing chlorine gas and caustic soda through the electrolysis of brine. In these processes mercury is used as an electrode and the industries are referred to as mercury-cell-type, chlor-alkali industries which were believed to contribute mercury to the aquatic environment. The second phase comprised the collection and analysis of organisms from areas receiving waste discharges from such industries. These phases culminated in confirming the presence of mercury, thus aiding in the delineation of the affected areas.

The third phase of the investigation was a statewide sampling program by the Game and Fish Commission and the GWQCB. The purpose was to determine mercury levels in the biota and to identify additional problem areas if they existed. Stations were established downstream from possible mercury sources. Waste sources included textile and pulp-paper, paint manufacturers, agricultural seed processors and urban areas. The period of investigation was from July 1970 to October 1971.

Statewide Investigation

Samples from fresh and saline waters were collected with the equipment and under the supervision of the State Game and Fish Commission. Samples from saline waters were collected primarily with shrimp trawl. Other methods employed were gill net, seine, hand picking (oysters), crab pots and nets. Samples were also obtained from commercial shrimp collectors, crab collectors and sport fishermen. Fresh water fish were mostly collected with electronic fishing equipment. Other fresh water methods included seine and set hooks, as well as collection from commercial fishermen. Gill net was used to collect American shad.

Samples were prepared in the field using only edible portions of each organism. A portion of muscle tissue was taken from finfish with the skin removed. Fillet meat and/or claw meat was collected from crabs, while the whole edible portion of shrimp was used. The samples were placed in plastic bags, tagged and frozen with dry ice. Replicates were prepared so that interlaboratory comparison could be made by two or three laboratories.

At the outset, the laboratory analysis of samples from the statewide investigation was undertaken by GWQCB during the summer of 1970 using AAS. However, the large volume of samples generated made it impractical for the laboratory to carry this extra load along with its other programs. Consequently a contract was made with the Georgia Institute of Technology (Ga. Tech) which used neutron activation analysis. Cross checks were routinely done by GWQCB and US EPA Southeast Water Laboratory (SEWL) both of which used flameless AAS (detection limits were 0.04 μg/g using 0.5 g sample).

Results and Discussion

Results are discussed in 5 geographical areas:

1. Seven (7) Freshwater River Basins, exclusive of the Savannah River (Augusta to Savannah).
2. The Savannah River from Augusta to Savannah.
3. The Savannah Estuarine Area.
4. The Georgia Coast, exclusive of the Brunswick area and the Savannah Estuarine area.
5. The Brunswick Area.

1. Seven River Basins

This region was investigated between September 1970 to February 1971. It was surveyed at 32 stations from which 141 organisms representing 23 species were collected and analyzed for mercury. Table 36 shows the species collected and enumerates the number of

TABLE 36

MERCURY DETERMINATION IN BIOTA FROM SEVEN MAJOR RIVER BASINS IN GEORGIA (EXCLUSIVE OF THE SAVANNAH RIVER) 1970-1971

Hg μg/g

SPECIES	NO. OF SAMPLES	RANGE	MEAN	STANDARD DEVIATION
Largemouth Bass	42	0.07-.99	0.37	0.22
Coosa Bass	2	0.39-.50	0.45	*
Bowfin	3	0.24-1.3	0.65	*
Chain Pickerel	3	0.20-.52	0.31	*
Redfin Pickerel	1	0.73	0.73	*
White Bass	2	0.25-.34	0.30	*
Channel Catfish	23	0.07-.52	0.21	0.11
Brown Bullhead	17	0.04-.38	0.19	0.09
White Catfish	1	0.37	0.37	*
Flat Bullhead	3	0.05-.61	0.25	*
Flathead Catfish	3	0.32-.45	0.40	*
Stonecat	1	0.08	0.08	*
Bluegill	2	0.23-.82	0.53	*
Shellcracker	2	0.17-.58	0.38	*
Redbreast Sunfish	2	0.17-.24	0.21	
Spotted Sucker	3	0.22-.88	0.44	*
Redhorse Sucker	10	0.09-1.4	0.44	0.37
Chubsucker	1	0.31	0.31	*
Carpsucker	2	0.41-.42	0.42	*
Carp	7	0.22-.71	0.51	*

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*Where less than 10 samples were analyzed over the 1-year period, the standard deviation was not determined.

TABLE 36 (continued)

SPECIES	NO. OF SAMPLES	RANGE	MEAN	STANDARD DEVIATION
American Shad	8	0.24-.64	0.38	*
Stoneroller	1	0.07	0.07	*
Clam	2	0.04-.06	0.05	*

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*Where less than 10 samples were analyzed over the 1-year period, the standard deviation was not determined.

samples of each. Also shown are the mean mercury concentration and the standard deviations for four of the species found. Largemouth bass and catfish were regarded as the desired fish in the freshwater basins and priority was placed on collecting them. The largemouth bass occupies a position at the top of the food chain and is distributed throughout much of the state in a variety of aquatic habitats. The various catfish are also widely distributed and are caught commercially in many areas. The catfish is omnivorous and is primarily a bottom feeder. When these two species were not available, the other species shown in Table 36 were collected, where possible.

This emphasis on collecting largemouth bass and catfish injected a bias in the collection, and makes a direct comparison of the data with that of the other rough species like carp and bowfin questionable. Two conclusions resulted from this approach. First, the bass and catfish were collected from the cleaner water and thus had generally lower levels of mercury than the rough types. Second, the bass specimens were collected in larger numbers and thus provide a more representative mean than would be the case with the rough types. For example, 42 samples of largemouth bass were analyzed while only 7 samples were analyzed for carp. However, the data indicates a relationship which seems to exist between fish size, weight, length, and concentration of mercury. There is generally a direct relationship; that is, the mercury level is proportional to the size of the fish. The data in Table 36 is taken from analyses done by the Georgia

Institute of Technology which did analyses on all the samples from the river basins. There were also some interlaboratory values done by the Southeast Water Laboratory and the Georgia Water Quality Control Board. Although the report states that the values from the interlaboratory analyses were similar, a close scrutiny of the values from the three sources reveals a fairly wide variation among values (Figure 49). This might result from the fact that the methodology for determining mercury in fish tissue was relatively new in these laboratories and was not completely routinized.

2. Savannah River (Augusta to Savannah)

Samples were collected from the Savannah River six times between July 1970 and October 1971. Up to six stations were used on each collecting trip. Two hundred and fifty six (256) fish, representing 22 species were collected. The predominant species collected were largemouth bass, spotted sucker and American shad (Table 37). The mean mercury concentration in largemouth bass in this phase of the study was 1.51 μg/g which is three times the US-FDA's maximum allowable concentration for human consumption. This was in contrast to 0.37 μg/g in the same species in the Seven River Basin Study. On the basis of the data from the Savannah River (Table 37) a section of the river was closed to fishing. The American shad was exempted from this regulation as mercury content was only 0.23 μg/g and sport fishing was subsequently allowed on a catch-and-release basis.

CHATTAHOOCHEE RIVER
GEORGIA HIGHWAY 91 TO FAIRCHILDS STATE PARK
GWQCB STATION NO. 60
DATE: 11-9-70

SAMPLE NO.	SPECIES	LENGTH (inches)	WEIGHT (lbs)	MERCURY (ug/gm Wet Weight Basis) LABORATORY		
				GA. TECH	SEWL	GWQCB
6001	Largemouth Bass	16.5	2.75	0.64	-	0.47
6002	Largemouth Bass	13.25	1.25	0.48	-	0.37
6003	Channel Catfish	11.0	0.25	0.09	-	-
6004	Brown Bullhead	11.0	0.5	0.14	-	-

CHATTAHOOCHEE RIVER
WALTER F. GEORGE RESERVOIR AT GEORGETOWN, GA.
GWQCB STATION NO. 61
DATE: 11-9-70

6101	Largemouth Bass	12.5	1.0	0.25	-	-
6102	Largemouth Bass	14.5	1.25	0.49	-	0.46
6103	Channel Catfish	13.0	0.5	0.30	-	-
6104	Channel Catfish	11.5	0.3	0.25	-	-

CHATTAHOOCHEE RIVER
BARTLETTS FERRY RESERVOIR - DOWNSTREAM FROM OSANIPPA CREEK
GWQCB STATION NO. 63
DATE: 10-23-71

6301	Largemouth Bass	19.0	4.75	0.41	-	0.54
6302	Largemouth Bass	13.5	1.5	0.19	-	-
6303	White Catfish	10.0	0.5	0.37	-	-
6304	Channel Catfish	12.0	1.0	0.15	-	-

FIGURE 49
COMPARISON OF GEORGIA INTERLABORATORY ANALYSES

TABLE 37

MERCURY DETERMINATIONS FROM THE SAVANNAH RIVER (AUGUSTA TO SAVANNAH) 1970-1971

Hg μg/g

SPECIES	NO. OF SAMPLES	RANGE	MEAN	STANDARD DEVIATION
Largemouth Bass	38	0.15-5.4	1.51	0.92
Striped Bass	9	0.34-1.01	0.70	*
White Bass	1	-	0.54	*
Chain Pickerel	5	0.76-2.4	1.61	*
Yellow Perch	11	0.58-4.00	1.35	1.33
Black Crappie	7	0.66-1.4	1.00	*
White Crappie	8	0.27-1.59	0.86	*
Bowfin	3	2.03-5.71	3.48	*
Channel Catfish	10	0.83-1.87	1.17	0.31
White Catfish	2	1.00-1.59	1.30	*
Brown Bullhead	3	0.23-0.51	0.38	*
Bluegill	16	0.06-1.23	0.50	0.26
Shellcracker	21	0.3-2.6	0.96	0.69
Redbreast Sunfish	13	0.26-1.06	0.60	0.26
Round Flier	1	-	0.45	*
Spotted Sucker	34	0.28-2.29	1.31	0.56
Redhorse Sucker	5	0.60-1.60	1.35	*
Carp	18	0.22-1.2	0.71	0.29
American Shad	15	0.08-.96	0.23	0.29
Gizzard Shad	21	0.03-.96	0.38	0.25

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*Where less than 10 samples were analyzed over the 1-year period, the standard deviation was not determined.

TABLE 37 (continued)

SPECIES	NO. OF SAMPLES	RANGE	MEAN	STANDARD DEVIATION
Mullet	16	0.06-.32	0.17	0.10
Channel Bass	1	-	1.00	*

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*Where less than 10 samples were analyzed over the 1-year period, the standard deviation was not determined.

It should be noted here that the mean mercury reported as 1.5 μg/g in largemouth bass for example, is not entirely representative of a true mean. This is so because the values from the 38 samples that were used to compute the mean were not all done by the same laboratory. Instead it represents a mean from a mix of values from the three laboratories. While one laboratory might determine mercury in largemouth bass on a given batch of samples, the others did not, and no one laboratory performed all the analyses. This fault is significant because where values were submitted by all three laboratories, they do not show a close degree of agreement. Despite this statistical limitation the mean value signifies the importance of the level of mercury found in these species. This technique of averaging was used throughout Table 37.

3. Savannah Estuarine Area

This area was investigated in August 1970. Five stations were selected representing the coastal waters of the Savannah, Georgia area from the mouth of Savannah Harbor to the south end of Wassaw Sound. Sixty-two organisms from nine species were collected.

Shrimp, blue crab, flounder and eastern oysters were the predominant species collected. The mean concentrations of mercury in these species were less than the 0.5 μg/g FDA limit (Table 38).

TABLE 38

MERCURY DETERMINATIONS IN BIOTA FROM THE SAVANNAH ESTUARINE AREA (1970-1971)

Hg μg/g

SPECIES	NO. OF SAMPLES	RANGE	MEAN	STANDARD DEVIATION
Shrimp	13		0.16	0.14
Blue Crab	15		0.43	0.22
Flounder	10		0.25	0.17
Spot	4	0.10-0.14	0.17	*
Speckled Trout	1		0.32	*
Weakfish	1		0.61	*
Mullet	3	0.10-0.17	0.10	*
Sea Catfish	3	0.19-0.83	0.42	*
Eastern Oyster	12		0.17	0.14

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*Where less than 10 samples were analyzed over the 1-year period, the standard deviation was not determined.

4. Georgia Coast

This area was exclusive of the Brunswick area and Savannah estuary. It was investigated from July 1970. Eleven stations in six coastal areas were sampled and 174 organisms were collected. This collection included seven species. Blue crab, shrimp, flounder and spot were the predominant species collected.

Mercury concentrations in the biota in this region of the Georgia coast were very low. The mercury found in these crabs was the highest with an average of 0.14 μg/g as shown in Table 39.

5. Brunswick Area

Sampling was done in this area eight times between July 1970 and August 1971. From one to twelve stations were sampled on each date, and the samples ranged from aquatic biota to bottom sediments.

Two hundred and eighty-two fish, crabs, and shellfish were collected and represented 16 species. The predominant species collected in the Brunswick area were the same as those collected from the remainder of the Georgia Coast, namely; shrimp, blue crab, spot and flounder. A summary of the data is shown in Table 40. Mercury concentrations in the biota appear to have decreased during the survey period. The average mercury concentration in blue crabs collected initially at four stations was 1.09 μg/g. The average at the last sampling from the same stations was 0.56 μg/g.

The results from the first phase of the investigation brought

TABLE 39

MERCURY DETERMINATIONS IN BIOTA FROM THE GEORGIA COAST EXCLUSIVE OF THE BRUNSWICK AREA AND SAVANNAH ESTUARINE AREA (1970-1971)

Hg μgm/gm

SPECIES	NO. OF SAMPLES	RANGE	MEAN	STANDARD DEVIATION
Shrimp	31	0.02-0.33	0.06	0.06
Blue Crab	22	0.05-1.6	0.14	0.17
Flounder	7	0.03-0.17	0.10	*
Spot	11	0.03-0.14	0.08	0.03
Speckled Trout	1	--	0.48	*
Weakfish	2	0.07-0.08	0.075	*
Hog Choker	1	-	0.05	*

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*Where the number of samples analyzed was less than 10 per species for the period, no calculation was done for the standard deviation.

TABLE 40

MERCURY DETERMINATIONS IN BIOTA FROM THE BRUNSWICK AREA (1970-1971)

Hg μg/g

SPECIES	NO. OF SAMPLES	RANGE	MEAN	STANDARD DEVIATION
Shrimp	76	0.03-1.31	0.26	0.23
Blue Crab	104	0.07-4.18	0.94	0.75
Speckled Trout	12	0.12-1.72	0.64	0.57
Weakfish	3	0.81-1.66		*
Spot	28	0.04-1.31	0.30	0.31
Drum	4	0.39-3.41		*
Flounder	16	0.03-2.85	0.63	0.52
Shad "type"	2	0.04-.05		*
Butterfish	4	0.04-.14		*
Sea Catfish	5	0.58-1.15		*
Croaker	14	0.05-1.2	0.45	0.42
Hog Choker	1	0.60		*
Spadefish	1	0.34		*
Eastern Oyster	14	0.03-.94	0.21	0.26
Mullet	1	0.05		*
Grunt	1	0.30		*

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*Where less than 10 samples were analyzed over the 1-year period, the standard deviation was not determined.

about the recommendation that fish and crabs should not be taken from the Brunswick area and fishing and crabbing was subsequently banned. Later as the levels decreased the ban was lifted and a warning was instituted against consumption of excessive quantities of fish and crabs from the area. Bottom samples from the Brunswick Area and the Savannah River were also analyzed and presented for the period July 1970 through March 1971. Twenty-nine samples were done from the Brunswick Area with a mean concentration of 0.42 µg/gm mercury. For the Savannah River 31 samples were analyzed and yielded a mean value of 0.15 µg/g mercury. These values are shown in Table 41 along with the range and standard deviation. The individual values over the period show a decline in the level of mercury in sediments.

TABLE 41

MERCURY DETERMINATION IN SEDIMENTS 1970-1971

SOURCE	NO. OF SAMPLES	RANGE	MEAN	STANDARD DEVIATION
Brunswick Area	29	0.04-1.90	0.42	0.52
Savannah River	31	0.04-0.60	0.15	0.14

CONCLUSION

1. The results of the investigation show that mercury pollution is a result of waste from two mercury-cell-type chlor-alkali plants. The pollution is localized to the water systems receiving the wastes from these plants. Both companies* involved were directed to reduce mercury discharges to less than 0.25 lbs per day, and to continue a program which would eventually eliminate mercury concentrations in their discharges.

2. Mercury in excess of 0.5 μg/g was found consistently in the biota of the Savannah River (Augusta to Savannah). The data did not indicate a reduction of mercury concentration in the biota of this section of the river during the period of the study. For this reason fish that were caught were deemed unfit for human consumption with the exception of the American shad which showed levels consistently below the maximum acceptable level of 0.5 μg/g.

3. In the Brunswick Area, mercury concentrations were generally greater than 0.5 μg/g in blue crab, speckled trout, and flounder, but showed a decreasing trend over the period of the study. Although the ban on fishing and crabbing was lifted, the public was warned not to eat excessive amounts of fish and crab caught in the area.

4. Mercury was detected in areas with no known mercury discharge in a few fish at greater than 0.5 μg/g. This pollution could result from sources such as the weathering of rocks, fall-out from air pollution, and runoff from agricultural areas.

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*Olin Corporation and Allied Chemical Corp.

5. The mercury concentrations found in organisms was generally directly proportional to size.

6. Piscivorous fish (species that eat other fishes) were found to contain higher concentrations of mercury than insectivorous species as well as those that fed on plankton. However suckers were generally found to contain levels of mercury comparable to the piscivorous species.

3.2 Georgia Department of Natural Resources: Environmental Protection Division

A three-volume report, Water Quality Monitoring Data for Georgia Streams 1973, was published in 1973 containing the data generated from a monitoring program of the streams in the state of Georgia which began in 1964. This was a comprehensive report and was the second in a series which sought to compile all the data collected throughout the state in one publication. In addition, the 1973 report contained biological data for the first time as well as that for the physical and chemical characteristics. The data was derived from analyses of samples from 179 permanent stations of which 39 are regarded as key or primary stations. The Georgia report deals only with freshwater streams. Data on estuaries and major reservoirs is to be published in separate reports in the future.

Fifteen river basins were monitored and analyses were performed on a wide range of water quality parameters. Frequency of sampling was generally monthly but some stations were sampled quarterly and semi-annually for special studies. Metals, including chromium, arsenic, lead, cadmium and mercury were determined for samples from many of the monthly stations.

The values reported show all these substances to be below levels of detection and thus not of any significance as components of polluting wastes. Figure 50 is illustrative of the type of data presented.

STATION 1207000

LOCATION: CHATTAHOOCHEE RIVER - COBB COUNTY WATER INTAKE

STREAM CLASSIFICATION: DRINKING WATER

TYPE OF STATION: ROUTINE, KEY

PERIOD OF RECORD: 02/01/68 TO DATE

SAMPLING FREQUENCY: MONTHLY

COOPERATING AGENCY: ATLANTA WATER WORKS

COMMENTS: THIS STATION WAS SELECTED TO MONITOR FOR COMPLIANCE WITH THE DRINKING WATER CRITERIA.

Mn mg/l	0.14
Cr mg/l	<0.05
Zn mg/l	<0.05
Cu mg/l	<0.05
Ni mg/l	<0.2
Ag mg/l	<0.05
Ba mg/l	-
As µg/l	<5
Pb µg/l	<10
Cd µg/l	<5
Hg µg/l	<0.2

FIGURE 50
SAMPLE OF GEORGIA WATER QUALITY MONITORING DATA

Sediment samples were collected from most of the key or primary stations in 1973 and analyzed for metals and PCB's. Substances detected were chromium, lead, cadmium, mercury and PCB's.

A breakdown of the data from the analyses shows that definite values for PCB were obtained from 15 of the 39 stations and represented 11 of the 22 river basins. The average value from the 15 stations is 288.9 μg/kg of PCB (Table 42). Eight of the individual values ranged from 9 to 57 μg/kg while seven ranged from 180 to 1800 μg/kg. The largest concentrations were 1800 and 930 μg/g from the Coosa River. High levels -- 260, 200 and 180 μg/kg were also reported for the Chattahoochee River. The source of the PCB contamination has been traced to the General Electric Plant in the area.

The sediment samples from 25 stations within 16 river basins also showed a significant concentration of chromium ranging from 6 to 81 μg/kg with an average of 17.72 μg/kg; lead ranged between 50 and 191 μg/kg; one station showed cadmium at a level of 7 mg/kg, while 10 stations had mercury ranging from 0.13 to 0.74 8 mg/kg for an average of 0.28 mg/kg. The remaining stations from which no definite values were reported indicated the presence of the five toxic substances mentioned, but at concentrations which were below detection points. Table 43 displays the detection limits.

TABLE 42

TOXIC SUBSTANCES
DETERMINATION IN SEDIMENTS
FROM ELEVEN RIVER BASINS 1973

TOXIC SUBSTANCE	NO. OF SAMPLES	μgm/kgm RANGE	μgm/kgm MEAN	STANDARD DEVIATION
PCB	15	9-1800	288.9	486.3
Chromium	25	6-81	17.7	17.9
Lead	3	50-191	97.0	*
Mercury	10	0.13-0.74	0.28	2.6
Cadmium	1	-	7.0	*

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*For less than 10 samples, no calculation was made for the standard deviation.

TABLE 43

DETECTION LIMITS FOR FIVE TOXIC SUBSTANCES
IN GEORGIA*

TOXIC SUBSTANCE	LIMITS
Cd	5 mg/kg
Cr	5 mg/kg
Hg	0.1 mg/kg
Pb	50 mg/kg
PCB	6 μg/kg

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*Georgia, DNR

3.3 Game and Fish Division, Department of Natural Resources

Mercury contamination of Georgia Rails was studied in a report presented to the Southeastern Association of Game and Fish Commissioners, White Sulphur Springs, West Virginia, November 1974.

Ninety-four specimens of rails (marsh birds hunted by sportsmen each fall), crabs, and snails collected at ten separate locations along the Georgia Coast between October 1971 and September 1973 were analyzed for residual mercury. The monitoring program which took place previously, between 1970 and 1971, was restricted to fish, crabs, shrimp and shellfish with no attempt to monitor levels in marsh birds or mammals within the contaminated area. Birds and mammals were present in large numbers and were an integral part of the salt marsh ecosystem. Hence, the desirability to investigate these birds and their food chain for mercury accumulation was evident.

In the first phase, a total of 62 rails, 12 snails, and 7 crabs from the ten stations were collected. The rail samples consisted of breast tissue, livers, feathers, beaks, eggs, and egg shells. Most specimens were collected in the Turtle River - Brunswick River Area, which was known to be heavily polluted with mercury. The initial collections were made in the Turtle River Marsh adjacent to Allied Chemical Plant at Brunswick in October, 1971. Seven rails, three snails, and one fiddler crab were collected at that time. Specimens were dissected on the same day with samples of breast muscle and liver being taken from each bird and frozen in the field prior to shipment to the laboratory in Atlanta.

A second set of specimens was collected between 15 February and 3 September 1973 at various locations along the Georgia Coast. This collection consisted of 65 rails, 6 snails, 3 square-back crabs and 3 fiddler crabs. All specimens were frozen upon return to the laboratory to be dissected later while they were partially frozen to avoid water loss from the tissues. Only the breast tissue from the rails was analyzed as priority in view of its potential as a health hazard through human consumption.

Results and Discussion

The results for the analyses are presented in Table 44. Six samples were done in 1971 on rail breast and liver tissue and resulted in mean values of 2.93 ppm and 5.38 ppm respectively.

The data shown in Table 44came from chemical analyses of samples taken during 1973. The Table reveals that 63 breast samples were analyzed, 29 liver samples and 19 samples of food specimen (rail's food). The values in all three categories varied widely but show a substantial accumulation of mercury. The food specimens -- crabs and snails, show the highest level of mercury with a mean value of 2.05 ppm and also the highest individual value of 16.8 ppm mercury.

TABLE 44

MERCURY CONCENTRATION IN GEORGIA RAILS

AND RAIL FOOD (ppm wet weight) 1973

SAMPLES	NO. OF SAMPLES	RANGE	MEAN	STANDARD DEVIATION
Rails (breast tissue)	63	0.01-9.45	1.72	1.91
Rails (liver)	29	0.33-12.08	1.70	2.44
Rail Foods	19	0.12-16.80	2.05	3.70

3.4 Bureau of Sport Fisheries and Wildlife

The Bureau of Sport Fisheries and Wildlife reported results of chemical analyses of samples of fish from the Savannah River and Altamaha River. Table 45 shows the breakdown of the data. Three species, catfish, largemouth bass, and bluegill were sampled and analyzed on a very limted basis for four of the toxic substances, arsenic, cadmium, mercury and lead. While this sampling was obviously too sparse to indicate any distribution or trend, data shows generally that values for all four substances were low in this series of tests. The highest value was 0.6 ppm mercury determined in largemouth bass taken from the Savannah River.

TABLE 45

TOXIC SUBSTANCES DETERMINATION IN FISH FROM THE SAVANNAH RIVER 1971

(ppm)

SPECIES	TOXIC SUBSTANCES	NO. OF SAMPLES	RANGE	MEAN
Catfish	Arsenic	1	0.01	0.01
	Cadmium	2	0.05	0.05
	Mercury	2	0.01-0.36	0.37
	Lead	2	0.10-0.14	0.12
Largemouth Bass	Arsenic	1	0.06	0.06
	Cadmium	2	0.05-0.05	0.05
	Mercury	2	0.34-0.60	0.47
	Lead	2	0.10-0.10	0.10
Bluegill	Arsenic	1	0.06	0.06
	Cadmium	2	0.05-0.50	0.28
	Lead	2	0.10-0.21	0.16
	Mercury	2	0.10-0.44	0.27

TABLE 45 (continued)

TOXIC SUBSTANCES DETERMINATION IN FISH FROM THE ALTAMAHA RIVER (Among the 7 River Basins)

SPECIES	TOXIC SUBSTANCES	NO. OF SAMPLES	RANGE	MEAN
Largemouth Bass	Arsenic	2	0.02-0.03	0.03
	Cadmium	1	0.05	0.05
	Lead	1	0.10	0.10
	Mercury	2	0.40	0.40
Spotted Sucker	Arsenic	2	0.06	0.06
	Cadmium	2	0.10-0.12	0.11
	Lead	1	0.16	0.16
	Mercury	2	0.22-0.23	0.23
Bluegill	Arsenic	2	0.09	0.09
	Cadmium	-	-	-
	Lead	-	-	-
	Mercury	2	0.12	0.12

Tables 46 through 50 show mercury determination in Biota from the surface water systems of Georgia for 1971-1974. Tables 46 and 47 represent data for 1971 for the Savannah River and the Brunswick Area. The concentrations of mercury found in both of these rivers were substantial with the highest values of 5.4 μg/gm in largemouth bass and 5.71 in bowfin (Table 46). The levels in the Brunswick Area were somewhat lower with the highest, 2.8 μg/gm found in the yellow tail perch (Table 47).

The 1972 data for samples from the Savannah River continued to show high levels of mercury for most species. The ranges for species like largemouth bass and spotted sucker increased over 1971, while species like yellow perch and striped bass decreased from the 1971 level (Table 48 vs Table 46). Mercury determined in tissue from the Brunswick Area are also high in 1972 and in most of the cases where similar species were tested in 1971 and 1972. The levels have shown increases in the upper limits of the range of values. The mercury levels in six species were above the US-FDA 0.5 μgm/gm limit (Table 49): as judged by the upper limits. However, only two species of crab showed mean concentrations above 0.5 ugm/gm.

The 1973 and 1974 data, Table 50, show that the species that were analyzed for mercury continue to display high levels of the substance. For example, in 1973, 11 of the 14 species had a mean mercury level above 0.5 μgm/gm with values as high as 2.5 μgm/gm for the shellcracker for which 19 samples were analyzed (Table 50).

TABLE 46

MERCURY DETERMINATION IN BIOTA FROM THE SAVANNAH RIVER 1971 ($\mu g/g$)

SPECIES	NO. OF SAMPLES	RANGE	MEAN	STANDARD DEVIATION
Largemouth Bass	21	0.44-5.40	1.55	1.08
Yellow Perch	13	0.54-4.00	1.3	1.28
Mullet	10	0.04-.95	0.18	0.28
Bluegill	5	0.25-1.25	0.59	*
Redbreast	11	0.26-1.06	0.53	0.24
Spotted Sucker	14	0.28-1.45	0.85	0.41
Black Crappie	10	0.66-1.40	1.07	0.27
Carp	7	0.47-.89	0.58	*
American Shad	1	0.09-.09	0.09	*
Striped Bass	5	0.34-.90	0.60	*
White Bass	1	0.54-.54	0.54	*
Shellcracker	15	0.39-2.6	1.20	0.61
Redhorse Sucker	4	1.25-2.0	1.54	*
Brown Bullhead	3	0.23-.51	0.38	*
Channel Catfish	10	0.83-1.87	1.12	0.32
Channel Bass	2	1.0-1.0	1.00	*
Chain Pickerel	5	0.76-2.4	1.61	*
Bowfin	3	2.7-5.71	3.70	*
Round Flier	1	0.45-.45	0.45	*
White Crappie	2	0.27-.43	0.35	*

---

*For less than 10 samples, no calculation was made for the standard deviation.

TABLE 47

MERCURY DETERMINATION IN BIOTA

FROM THE BRUNSWICK AREA 1971 ($\mu g/g$)

SPECIES	NO. OF SAMPLES	RANGE	MEAN	STANDARD DEVIATION
Sea Cat	4	0.89-1.09	1.00	*
Blue Crab	39	0.11-4.50	1.04	0.98
Shrimp	17	0.09-0.34	.27	0.13
Croker	13	0.05-1.20	.42	0.39
Drum	1	1.8-1.80	1.80	*
Speckled Trout	1	0.46-0.46	0.46	*
Flounder	1	0.7-0.70	0.70	*
Sheepshead	1	0.64-0.64	0.64	*
Summer Trout	2	0.28-0.37	0.33	*
Grunt	1	0.74-0.74	0.74	*
Black Drum	2	1.0-1.00	1.00	*
White Shrimp	7	0.11-0.53	0.35	*
Spot	3	0.06-0.09	0.08	*
Silver Perch (Yellow Tail)	7	0.15-2.80	1.57	*

---

*For less than 10 samples, no calculation was made for the standard deviation.

TABLE 48

MERCURY DETERMINATION IN BIOTA
FROM THE SAVANNAH RIVER 1972 (μg/g)

SPECIES	NO. OF SAMPLES	RANGE	MEAN	STANDARD DEVIATION
Chain Pickerel	20	0.25-1.60	0.85	0.37
Bowfin	4	0.80-1.20	0.92	*
Spotted Sucker	22	0.12-2.00	0.84	0.57
Shell Cracker	5	0.21-3.20	0.90	*
Redbreast	11	0.18-0.54	0.33	0.12
Bluegill	14	0.10-0.98	0.37	0.25
Redear Sunfish	11	0.17-0.64	0.37	0.31
Chub Sucker	2	0.21-0.25	0.23	*
Largemouth Bass	19	0.13-6.00	1.66	1.18
Blue Back Herring	2	0.11-0.12	0.12	*
Carp	12	0.53-1.20	0.84	0.22
Gizzard Shad	6	0.08-0.17	0.11	*
Yellow Perch	1	0.20-0.20	0.20	*
Striped Bass	4	0.55-0.80	0.63	*
Channel Catfish	1	1.10-1.10	1.10	*
White Catfish	2	1.40-1.50	1.45	*

---

* For less than 10 samples, no calculation was made for the Standard Deviation.

TABLE 49

MERCURY DETERMINATION IN BIOTA
FROM THE BRUNSWICK AREA 1972 (μg/g)

SPECIES	NO. OF SAMPLES	RANGE	MEAN	STANDARD DEVIATION
Blue Crab	32	0.16-1.80	0.81	0.46
Shrimp	28	0.05-0.42	0.21	0.13
Croaker	11	0.06-1.50	0.24	0.42
Rock Sea Bass	2	0.39-0.40	0.39	*
White Shrimp	12	0.05-0.22	0.13	0.05
Black Sea Bass	1	0.15-0.15	0.15	*
Spot	11	0.05-0.84	0.15	0.23
Crab	20	0.18-3.60	1.79	1.14
Brown Shrimp	3	0.06-0.17	0.11	*
Yellow Tail	11	0.08-1.60	0.76	0.42
Menhaden	3	0.15-0.17	0.17	*
Summer Trout	3	0.13-0.64	0.31	*
Whiting	2	0.11-0.12	0.12	*
Sea Trout	1	0.29-0.29	0.29	*

---

*For less than 10 samples, no calculation was made for the Standard Deviation.

TABLE 50

MERCURY DETERMINATION IN BIOTA
FROM THE SAVANNAH RIVER 1973 - 1974

1973

Hg μg/g

SPECIES	NO. OF SAMPLES	RANGE	MEAN	STANDARD DEVIATION
Bluegill	7	0.08-0.26	0.21	*
Redbreast	10	0.12-1.70	0.76	0.59
Largemouth Bass	31	0.47-2.90	1.16	0.55
Chain Pickerel	10	0.18-1.90	0.97	0.26
Carp	18	0.13-1.21	0.79	0.29
Spotted Sucker	11	0.18-1.40	0.70	0.35
Carp Sucker	2	0.42-0.46	0.44	*
Flyer Bream	1	0.82-0.82	0.82	*
Yellow Perch	3	0.40-0.88	0.58	*
Blue Crappie	3	0.96-0.98	0.97	*
Sucker	8	0.17-2.50	1.20	*
Shellcracker	19	0.18-1.30	0.54	0.33
Striped Bass	3	0.38-0.48	0.42	*
Red Horse Sucker	4	0.31-1.10	0.85	*

---

*Where number of samples analyzed were less than 10, the standard deviation was not calculated.

TABLE 50 (continued)

1974

SPECIES	NO. OF SAMPLES	[illegible]	MEAN	STANDARD DEVIATION
Jack	2	0.38-0.96	0.67	*
Largemouth Bass	18	0.32-2.40	1.35	0.57
Redear	2	0.75-0.82	0.79	*
Warmouth	1	0.49-0.49	0.49	*
Redbreast	12	0.24-1.90	0.66	0.48
Spotted Sucker	9	0.32-1.80	1.16	*
Shell Cracker	10	0.27-1.20	0.65	0.28
Sucker	3	1.10-1.15	1.27	*
Carp	9	0.48-2.20	0.92	*
Chain Pickerel	7	0.25-1.50	0.86	*
Blue Gill	2	0.67-0.77	0.72	*
Red Horse Sucker	5	0.31-1.80	1.13	*
Bowfin	2	1.30-1.70	1.50	*

---

*Where number of samples analyzed were less than 10, the standard deviation was not calculated.

Overall, the survey for mercury over the four-year period revealed no consistent decreasing pattern in the fish analyzed. An examination of the mean values for those species that were common to the analysis each year from the Savannah River illustrates this point (Table 51). Only three species, bluegill, shellcracker, and spotted sucker consistently decreased between 1971 and 1973, but then the values rose again in 1974. Three species, largemouth bass, chain pickerel and bowfin had less mercury in 1974 than in 1973, while four species, bluegill, redbreast, sunfish carp, and spotted sucker had more mercury than in 1971.

That there was not a definite consistent decrease in mercury level is somewhat puzzling in view of the fact that the concentration of the metal in the effluent from the primary dischargers decreased substantially. Table 52 shows the drop in mercury levels in the wastes of the Allied Chemical Corporation and Olin Corporation. Prior to 1970 and June of 1972 there was a reduction from 3 to 0.13 and 10 to 0.04 lb per day respectively. In spite of these major reductions in mercury in the waste, there were no remarkable differences in levels from the biota of the water systems. This could be a result of residuals in the bottom layers of the waters and probable resuspension of previously deposited insoluble mercury.

TABLE 51

MEAN CONCENTRATION OF MERCURY
THE SAVANNAH RIVER 1971-1974 (μg/g)

SPECIES	1971	1972	1973	1974
Largemouth Bass	1.55	1.66	1.16	1.34
Bluegill	0.59	0.37	0.21	0.72
Chain Pickerel	1.61	0.85	0.97	0.86
Redbreast Sunfish	0.53	0.33	0.70	0.66
Carp	0.58	0.84	0.78	0.92
Yellow Perch	1.35	0.20	0.58	-
Bowfin	3.70	0.92	-	1.50
Spotted Sucker	0.85	0.84	0.70	1.16
Striped Bass	0.60	0.63	0.42	-
Shellcracker	1.20	0.90	0.54	0.65

TABLE 52

GEORGIA MERCURY DISCHARGERS*

DATE	ALLIED CHEMICAL CORP. BRUNSWICK pounds/day	OLIN CORPORATION AUGUSTA pounds/day
PRIOR TO MAY 1970	approx. 3.0	approx 10.0
June 1970	1.03	1.50
December 1970	0.14	0.21
June 1971	0.14	0.10
December 1971	0.10	0.07
June 1972	0.13	0.04

---

*Georgia DNR - Environmental Protection Division

3.5 Georgia Department of Agriculture

One area in which the Georgia Department of Agriculture supplied a significant amount of data was in the area of PCB contamination. In 1970 there was a major incident where PCB's got into feed used by chicken farmers in a several-state region. A number of chicks died, and the thin eggshell effect was threatening the livelihood of a large number of farmers. At the time, the Georgia Department of Agriculture was one of the few agencies in the region experienced in PCB analysis, and since the Georgia laboratory was equipped for PCB analysis, the U.S.D.A. and F.D.A. enlisted Georgia's support in analyzing chickens and eggs for possible contamination. For a period of several months the pesticides-residue laboratory concentrated on PCB's and accumulated a large amount of data. This data was received by MITRE and analyzed. Tables 53, 54 , and 55 show the PCB data on various types of poultry farm media broken down into categories of AROCLOR 1242, AROCLOR 1254, AROCLOR 1260, and general PCB. As is evident from the tables, the bulk of the PCB study effort took place in 1971. It is the case that for the different types of PCB compounds calculated for the study effort, the values were consistently high in silage and in various types of poultry feed. These high values are consistently reflected in the animal tissue, eggs, and milk values as shown in the tables. The highest incidence of PCB contamination was an isolated case in 1971 where nesting material (shredded IBM paper) was found to have 32,000 ppm of AROCLOR 1242.

TABLE 53

GEORGIA DEPARTMENT OF AGRICULTURE
PCB CONTAMINATION STUDY - PCB's (ppm)
AROCLOR 1242

SAMPLE MATERIAL	NO. OF SAMPLES	RANGE	MEAN	STANDARD DEVIATION
1971				
FEEDS	31	0.1 - 594	29.66	111.13
BLOOD SERUM	2	0.1 - 0.6	0.35	---
TISSUE	2	0.3 - 20.6	10.45	---
LIVER	5	0.01 - 12	2.41	---
WATER	1	0.01 - 0.01	0.01	---
POULTRY FAT	14	0.2 - 32.4	13.03	12.84
EGGS	19	0.1 - 31.0	3.27	6.79
IBM PAPER (Nesting Material)	1	32000 32000	32000	---
STABILIZER	3	0.1 - 0.1	0.1	---
POULTRY BY-PRODUCTS	5	0.1 - 0.1	0.1	---
CHICKEN CARCASS	1	0.3 - 0.3	0.3	---
1972				
CHICKEN FAT	4	0.1 - 2.1	0.69	---
EGGS	1	0.1 - 0.1	0.1	---
1974				
SOYMEAL	1	0.39 - 0.39	0.39	---
COMPOST	1	2.13 - 2.13	2.13	---

TABLE 54

GEORGIA DEPARTMENT OF AGRICULTURE
PCB CONTAMINATION STUDY - PCB's (ppm)
AROCLOR 1254

SAMPLE MATERIAL	NO. OF SAMPLES	RANGE	MEAN	STANDARD DEVIATION
1971				
SILAGE	2	0.33-4100	2050.17	---
MILK	3	1.3 - 4.9	2.94	---
CHICKEN CARCASSES	1	1.0 - 1.0	1.0	---
1972				
SILAGE	15	0.37-6500	1118.95	2089.27
MILK	25	0-16.3	5.27	4.04
CHICKEN FAT	1	0.83- 0.83	0.83	---
FEED	1	0.05- 0.05	0.05	---
1973				
MILK	6	1.31- 4.78	3.57	---
SILAGE	5	3.47-7500	1829.4	---
GROUND BEEF	1	0.5 - 0.5	0.5	---
		AROCHLOR 1260		
1974				
TEA	1	40 - 40	40	---

TABLE 55

GEORGIA DEPARTMENT OF AGRICULTURE
PCB CONTAMINATION STUDY - PCB's (ppm)

SAMPLE MATERIAL	NO. OF SAMPLES	RANGE	MEAN	STANDARD DEVIATION
1971				
SILAGE	1	0.10-0.10	0.1	---
MILK	5	1.70-11.70	5.48	---
POULTRY FAT	86	0.10-41.20	4.82	7.33
EGGS	86	0.10-0.98	0.231	.289
ROOSTER TISSUE	1	0.56-0.56	0.56	---
FEEDS	17	0.10-1700	104.6	411.4
CATFISH	1	0.10-0.10	0.1	---
CHICKEN LITTER	3	0.33-0.57	0.48	---
POULTRY BY-PRODUCTS	7	0.10-0.10	0.1	---
FIBERGLASS BIN USED FOR CHICKEN NESTING	1	0	0	---
1972				
MILK	25	0.00-3.10	0.336	.743
FEED	4	0	0	---
EGGS	2	0.00-0.10	0.05	---
SILAGE	2	0	0	---
POULTRY FAT	5	1.00-2.52	1.58	---
1973				
MILK	1	1.44-1.44	1.44	---
SILAGE	1	0	0	---
1974				
SILAGE	1	0	0	---
LATEX	1	0	0	---

3.6 Georgia Air Sampling Network

The state of Georgia's Air Monitoring Network consists of a total of 50 sites. Various sampling techniques and methods are used at these sites, although high volume particulate sampling is the most prevalent. Of the 50 sites, 44 conduct Hi-Vol sampling. MITRE received Hi-Vol data for 13 sites for the years 1970 through 1973, and processed the air data from 1971-1973. The only toxic substance checked in the filter analysis was lead.

An example of the air data as received from Georgia appears as Figure 51. This data was coded on SAROAD Monthly Composite Data forms, keypunched, and processed with a statistical program to produce the desired data parameters. The Georgia data is presented in Appendix A in its final computer printout form.

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GEORGIA AIR SAMPLING NETWORK

AIR QUALITY EVALUATION SERVICE

YEAR 1973

SITE ATHENS - CLARKE COUNTY

	SUSPENDED PARTICULATE ANALYSES				GASEOUS ANALYSES					
MONTH	DAY	PARTICULATE, ug/m3*	PB, ug/m3*	BENZENE SOLUBLES, ug/m3*	DAY	NO2, ppm*	SO2, ppm*			
JANUARY	16	101	2.0							
FEBRUARY	8	15								
	21	22	0.4							
MARCH	5	31								
	29	TD	0.3	4.0						
QUARTERLY COMPOSITE		42	0.9	4.0						
APRIL	22	42	0.2							
MAY	4	42								
	16	64	0.7	3.0						
JUNE	12	50								
	21	34	0.6							
QUARTERLY COMPOSITE		46	0.5	3.0						
JULY	3	65								
	15	43	0.5							
	27	37								
AUGUST	8	71								
	21	69	0.9	4.4						
SEPTEMBER	4	68								
	13	33	0.6							
QUARTERLY COMPOSITE		55	0.7	4.4						

** Estimated Figure - No CFM on data card
* UG/M^3 - Micrograms per cubic meter
* PPM - Parts Per Million

FIGURE 51
GEORGIA AIR SAMPLING NETWORK DATA

3.7 City of Atlanta-Department of Waterworks-Water Treatment Division

MITRE received a brief summary of concentrations and related analytical data for eight chemical constituents; cadmium, chromium, cyanide, arsenic, lead, mercury, beryllium, and PCB's.

Cadmium, chromium, and lead are determined by atomic absorption spectrophotometry. These analyses are performed on weekly composite samples. The minimum detectable limit is 5 ppb.

Cyanide determinations are performed by either distillation or specific ion electrode. The electrode method is used for analysis of a weekly composite sample, with a minimum detectable limit of 0.01 ppm.

Arsenic determinations are performed by the diethyldithiocarbamate method. Analysis is done on a weekly composite sample with a minimum detectability limit of 0.03 ppm.

Mercury analysis is performed daily using the Coleman mercury analyzer, which is an emission technique. Minimum detectable limits are 0.1 ppb.

At the present time analyses are not performed for beryllium, although it will be done in the near future using AAS.

PCB analysis is not done at this time because of the lack of a gas chromatograph equipped with an electron capture detector.

Analytical results of the most recent data available through the Department of Waterworks--Water Treatment Division, is shown in Table 56. As can be seen from this table, there are no areas in which the Atlanta river water or tap water is in violation of the current standards.

TABLE 56

CITY OF ATLANTA

RIVER AND TAP WATER ANALYSIS

ELEMENT	STANDARD	RIVER WATER	TAP WATER
Cadmium	<0.01 ppm	<0.01 ppm	0.01 ppm
Chromium	<0.05 ppm	<0.01 ppm	0.01 ppm
Lead	<0.05 ppm	<0.01 ppm	0.01 ppm
Cyanide	<0.2 ppm	<0.01 ppm	0.01 ppm
Arsenic	<0.05 ppm	<0.03 ppm	0.03 ppm
Mercury	<0.002 ppm	<0.1 ppb	0.1 ppb
Beryllium	N. A.*	N. D.**	N. D.**
PCB	N. A.*	N. D.**	N. D.**

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* Not Applicable
** Not Determined

4.0 TEXAS AGENCY DATA ANALYSIS

4.1 Texas State Department of Health

Organochlorine pesticide residue levels were determined in 221 samples of human adipose tissue from elective surgery in 1969-72 in the lower Rio Grande Valley of Texas. Standard electron capture - gas - liquid chromatographic methods were used. PCB's were detected in 15 samples in 1971 but none were detected in the other 3 years.

The type of surgery from which adipose samples were drawn is shown in Table 57. The proportion of lipid in the samples averaged 77.2 percent. There was no correlation between age and pesticide residues; almost all tissue samples were from adults.

The detection of PCB's is detailed in Table 58; surprisingly, these residues appeared only during 1971. This group of 13 people, compared to people not having PCB's, did not differ significantly in sex, ethnic background, sample storage time, surgical procedure, or level of pesticide residues; but they were slightly older: 62.5 years vs 51.5 years.

4.1.1 Texas State Department of Health - Division of Shellfish Sanitation Control

MITRE received data from the survey on metals in seafood conducted by the Division of Shellfish Sanitation Control. This agency monitors shellfish, primarily oysters, along the Texas coast for bacteriological parameters and some select heavy metals. This data is entered into a data processing system which is maintained by this agency. Tables 59, 60, 61, and 62 display the values calculated for chromium, arsenic,

TABLE 57*

CLASSIFICATION OF ELECTIVE SURGERY
SUPPLYING ADIPOSE TISSUE - TEXAS, 1969-72

INGUINAL HERNIA	44%
UMBILICAL HERNIA	27%
INCISIONAL HERNIA	13%
HERNIA, OTHER	4%
LIPOMA	6%
OTHER TYPES OF SURGERY	6%
	100%

TABLE 58

PCB's IN HUMAN ADIPOSE TISSUE FROM
ELECTIVE SURGERY - TEXAS, 1969-72

	PCB's	(0= > 0.5 PPM)		
	NO. SAMPLES	%POSITIVE	MEAN, ppm	RANGE, ppm
TOTAL	221	7	0.1	0-9.9
YEAR				
1969	26	0	0	0
1970	68	0	0	0
1971	88	15	1.7	0.6-9.9
1972	39	0	0	0
SEX (1971 only)				
Male	42	24	2.3	0.6-9.9
Female	46	11	0.9	0.6-1.0
ETHNIC BACKGROUND[1] (1971 only)				
MEX.-AMER.	61	15	0.9	0.6-1.4
ANGLO.-AMER.	27	22	2.9	0.8-9.9

---

*Source: Texas State Department of Health

[1] By Surname

TABLE 59
STUDY OF METALS IN SEAFOODS IN TEXAS ESTURARIES–Cr and As (mg/kg)

						CHROMIUM										
		OYSTERS				CRABS				FINFISH				SHRIMP			
LOCATION	YEAR	NO. OF SAMPLES	RANGE	MEAN	STD. DEV.	NO. OF SAMPLES	RANGE	MEAN	STD. DEV.	NO. OF SAMPLES	RANGE	MEAN	STD. DEV.	NO. OF SAMPLES	RANGE	MEAN	STD. DEV.
Sabine Lake	1972	2	.5-.6	.55	-	4	.5-.5	.5	-	6	.5-.5	.5	-	1	.5-.5	.5	-
Trinity Bay	1972	1	.5-.5	.5	-												
Galveston Bay	1973	3	.4-.4	.4	-	3	.4-.4	.4	-					1	.4-.4	.4	-
West Bay	1971	1	.4-.4	.4	-												
Lavaca Bay	1971	17	.2-.6	.447	.142												
	1973	4	.4-.4	.4	-	9	.4-.6	.422	-								
						ARSENIC											
Lavaca Bay	1971	16	.6-1.4	.913	.2726												

TABLE 60
STUDY OF METALS IN SEAFOODS IN TEXAS ESTUARIES—Cd (mg/kg)

LOCATION	YEAR	NO. OF SAMPLES	RANGE	MEAN	STD. DEV.	NO. OF SAMPLES	RANGE	MEAN	STD. DEV.	NO. OF SAMPLES	RANGE	MEAN	STD. DEV.	NO. OF SAMPLES	RANGE	MEAN	STD. DEV.
Sabine Lake	1972	2	.76-.86	.81	-	4	.05-.05	.05	-	6	.05-.05	.05	-	1	.05-.05	.05	-
	1974	3	.5-.7	.6	-												
East Bay	1972	1	.63-.63	.63	-												
Trinity Bay	[illegible]	1	.51-.51	.51	-	2	.05-.11	.08	-	1	.05-.05	.05	-				
	1974					2	.2-.2	.2	-	1	.2-.2	.2	-	1	.22-.22	.22	-
Galveston Bay	1972					4	.05-.11	.08	-	4	.05-.1	.0875	-	4	.05-.1	.0675	-
	1973	4	.31-.44	.395	-	3	.04-.07	.6	-					1	.04-.04	.04	-
	1974	11	.5-.7	.6	.1	2	.1-.2	.15	-	1	.2-.2	.2	-	1	.2-.2	.2	-
West Bay	1971	1	2.7-2.7	2.7	-												
	1974	6	.5-.76	.646	-												
Freeport Area	1976	6	.2-.38	.312	-												
East Matagordo Bay	1976					1	.5-.5	.5	-								
Tres Palacios Bay	1973	1	.75-.75	.75	-												
Lavaca Bay	1971	17	.1-2.7	.641	.555												
	1973	6	.05-.63	.312	-	9	.2-.2	.2	-								
	1974	14	.5-.9	.757	.1284	9	.1-.5	.356	-								
Copano Bay	1974	3	.6-.7	.633	-	1	.3-.3	.3	-								
Aransas Bay	1974	3	.6-.7	.633	-	1	.4-.4	.4	-								
Corpus Christi Bay	1974	8	.9-1.8	1.262	-												
Nueces Bay	1974	7	1.8-4.1	3.186	-												
South Bay	1974	1	.6-.6	.6	-												

TABLE 61
STUDY OF METALS IN SEAFOODS IN TEXAS ESTUARIES–Pb (mg/kg)

LOCATION	YEAR	OYSTERS				CRABS				FINFISH				SHRIMP			
		NO. OF SAMPLES	RANGE	MEAN	STD. DEV.	NO. OF SAMPLES	RANGE	MEAN	STD. DEV.	NO. OF SAMPLES	RANGE	MEAN	STD. DEV.	NO. OF SAMPLES	RANGE	MEAN	STD. DEV.
Sabine Lake	1972	2	.56-1.35	.955	-	4	.62-2.28	1.27	-	6	.19-.72	.398	-	1	1.74-1.74	1.74	-
	1974	3	.2-.2	.2	-												
East Bay	1972	1	.5-.5	.5	-												
Trinity Bay	1972	1	.31-.31	.31	-	2	.05-.11	.08	-	1	.5-.5	.5	-	1	.22-.22	.22	-
	1974					2	.2-.2	.2	-	1	.3-.3	.3	-				
Galveston Bay	1972					3	.5-.15	.2667	-	1	.5-.5	.5	-	3	.13-.5	.28	-
	1973	4	.2-.5	.425	-	4	.5-.7	.55	-					1	.7-.7	.7	-
	1974	11	.2-.4	.2182	.0608	2	.3-.6	.45	-	1	.2-.2	.2	-	1	.2-.2	.2	-
West Bay	1974	6	.1-.2	.15	-												
Freeport Area	1974	6	.1-.2	.183	-												
East Matagordo Bay	1974					1	1.0-1.0	1.0	-								
Tres Palacios Bay	1973	1	.3-.3	.3	-												
Lavaca Bay	1971	15	.3-1.5	.687	.2798												
	1973	6	.2-.5	.417	-	9	.5-.5	.5	-								
	1974	14	.2-.5	.243	.0848	9	.2-.7	.444	-								
Copano Bay	1974	3	.2-.3	.233	-	1	.2-.2	.2	-								
Aransas Bay	1974	3	.1-.2	.133	-	1	.7-.7	.7	-								
Corpus Christi Bay	1974	8	.2-1.3	.378	-												
Nueces Bay	1974	7	.2-.4	.243	-												
South Bay	1974	1	.2-.2	.2	-												

TABLE 62
STUDY OF METALS IN SEAFOODS IN TEXAS ESTUARIES—Hg (mg/kg)

		OYSTERS				CRABS				FINFISH				SHRIMP			
LOCATION	YEAR	NO. OF SAMPLES	RANGE	MEAN	STD. DEV.	NO. OF SAMPLES	RANGE	MEAN	STD. DEV.	NO. OF SAMPLES	RANGE	MEAN	STD. DEV.	NO. OF SAMPLES	RANGE	MEAN	STD. DEV.
Sabine Lake	1971	2	.05-.1	.75	-	3	.07-.1	.0567	-								
	1972	3	.05-.9	.33	-	5	.08-.13	.112	-	6	.08-.2	.12	-	1	.05-.05	.05	-
East Bay	1972	1	.05-.05	.05	-												
Trinity Bay	1971	2	.1-.1	.1	-	3	.06-.27	.19	-	3	.05-.12	.0734	-	4	.01-.05	.04	-
	1972	2	.05-.06	.055	-	3	.1-.17	.1234	-	2	.05-.1	.075	-	2	.05-.1	.075	-
	1974					2	.12-.15	.135	-	1	.06-.06	.06	-				
Galveston Bay	1971	6	.05-.1	.0834	-	11	.04-.53	.2282	.1503	11	.04-.13	.0609	.0282	9	.01-.05	.0456	-
	1972	1	.05-.05	.05	-	5	.07-.37	.1720	-	3	.05-.1	.25	-	5	.05-.1	.07	-
	1973	4	.01-.11	.0693	-	3	.17-.28	.24	-					1	.02-.02	.02	-
	1974	11	.009-.2	.0287	.0574	2	.05-.30	.175	-	1	.02-.02	.02	-	1	.02-.02	.02	-
West Bay	1971	1	.02-.02	.02	-												
	1974	6	.01-.05	.0234	-												
Freeport Area	1971	2	.09-.16	.1250	-												
	1974	6	.02-.03	.025	-												
East Matagordo Bay	1971	1	.1-.1	.1	-	1	.13-.13	.13	-								
Matagordo Bay	1971	1	.05-.05	.05	-												
Tres Palacios Bay	1971	1	.1-.1	.1	-												
	1973	1	.05-.05	.05	-												
Lavaca Bay	1971	112	.02-.66	.2204	.1233	25	.42-2.9	1.3976	.7023	9	.17-.99	.5778	-	1	.08-.08	.08	-
	1972	32	.09-.37	.1857	.0728	2	.53-1.1	.815	-					1	.1-.1	.1	-
	1973	6	.13-.28	.185	-	18	.19-3.6	1.2112	.9911								
	1974	17	.05-.22	.1159	.0539	17	.2-1.1	.7118	.2764								
San Antonio Bay	1971	2	.05-.05	.05	-												
Copano Bay	1971									1	.1-.1	.1	-				
	1974	3	.02-.03	.0267	-	1	.2-.2	.2	-								
Aransas Bay	1974	3	.02-.03	.0267	-	1	.22-.22	.22	-								
Corpus Christi Bay	1971									1	.1-.1	.1	-				
	1974	8	.02-.04	.0288	-												
Nueces Bay	1974	7	.02-.05	.0315	-												
South Bay	1974	1	.02-.02	.02	-												

cadmium, lead, and mercury. As can be seen from the tables, most of the sampling effort has been directed toward the detection of mercury. This keen interest in mercury detection was initiated in 1970 when a considerable amount of mercury contamination occurred in Lavaca Bay owing to mercury discharge from an Alcoa plant in that immediate area. A monetary loss was incurred by the oyster fisheries during this period, and legal action was taken to remedy this contamination problem. As can be seen from Table 62, 112 samples of oysters were taken in Lavaca Bay in 1971, showing a mean mercury value of 0.2204 mg/kg. Only 17 samples were taken in 1974, showing a mean value of 0.1159 mg/kg. This demonstrates an approximate 50% reduction in average detected mercury levels over this four year sampling period.

Data is also displayed for chromium and arsenic in Table 59. The mean levels of chromium in all the sampling locations seem fairly consistent in nature, ranging from 0.4 mg/kg to 0.55 mg/kg. The only arsenic sampling that was undertaken was done in Lavaca Bay in 1971 showing a mean value of 0.913 mg/kg.

The cadmium values displayed in Table 60 show the highest values in 1974 in Corpus Christi Bay and Nueces Bay oysters with mean values of 1.262 mg/kg and 3.186 mg/kg respectively.

Table 61 shows the lead values calculated from the data, and shows the highest lead values in 1972 in Sabine Lake in oysters and crabs with mean values of 0.955 mg/kg and 1.27 mg/kg, respectively.

4.2 Texas Parks and Wildlife

In August of 1971 the Texas State Department of Health in cooperation with Texas Parks and Wildlife initiated a study of the incidency of mercury in fishes of The Concho River System. The laboratory report of preliminary samples taken from sampling stations on the Concho indicated a mean mercury level of .34 mg/kg in four specimens of large mouth bass with the maximum level of .55 mg/kg being found in one specimen of approximately four pounds body weight. Other samples analyzed include warmouth and white crappie with mercury levels being found at .11 and .37 mg/kg respectively. The sample analysis results appear as Table 63.

TABLE 63

SAMPLE ANALYSIS RESULTS

SAMPLE	mg/kg of Hg
Station #1 - Warmouth 8/19/71	0.11
Station #1 - White Crappie 8/19/71	0.37
Station #2 - Largemouth Bass 8/19/71 (4 lb)	0.55
Station #2 - Largemouth Bass 8/19/71 (2 1/2 lb)	0.30
Station #3 - Largemouth Bass 8/16/71	0.24

An additional group of data was attached to the preliminary group of data. A statistical summary of this data appears in Table 64. This data was generated from fish samples from four locations in Texas and includes 10 species from June and July of 1971. The four locations were Concho River, Lake Nasworthy, Twin Buttes, and Spring Creek.

TABLE 64

MERCURY IN TEXAS FISH IN JUNE AND JULY 1971
(Hg. ppm)

SPECIES	NO. SAMPLES	RANGE	MEAN	STD. DEV.
White Bass	36	.2-2.47	0.842	0.704
Flathead Catfish	1	.820	0.820	*
Channel Catfish	34	.066-.596	0.221	0.122
Shad	33	.005-.551	0.156	0.149
Crappie	7	.04-.739	0.237	*
Gar	4	.096-.253	0.189	*
Drum	11	.091-.870	0.342	0.234
Carp	3	.217-.306	0.266	*
Carp Sucker	6	.137-.436	0.312	*

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*Where less than 10 samples were analyzed, the standard deviation was not calculated.

4.3 Texas Air Control Board - ASARCO Zinc Smelter-Amarillo, Texas

Previous Studies

Four previous studies were conducted at the ASARCO Smelter; property line sampling, soil and vegetation sampling, stack sampling, and a study of retort shed emissions. Of these four, two are of interest to the study on toxic substances.

Property line sampling was conducted using Hi-Vol sampling down-wind of the ASARCO retort sheds in May of 1970. The closer samples showed as much as .15 percent cadmium, and 2.6 percent lead.

Surface soil samples were taken but were listed as upwind and down-wind and were not analyzed below the 100 ppm level. Four grass samples were analyzed. Average results were 2.5 ppm cadmium, and 31 ppm lead.

Roaster Duct and Sintering Plant Duct Sampling

During the period of May 8-22, 1972, samples were taken from the roaster duct and the sintering plant duct at ASARCO, Amarillo. The emissions from both ducts are vented to the atmosphere through a single 400 foot stack. This sampling revealed that the average mercury concentration in the roaster duct was 1.805 $\mu g/ft^3$, and the sintering plant duct average was .216 $\mu g/ft^3$ of mercury.

Ambient Air Sampling for Heavy Metals

Ambient air sampling was conducted with 24 high-volume air samplers over about a 30-square mile area within a radius of approximately 0.6 to 4.5 miles from ASARCO. During the sampling period (April-May '72), prevailing winds give a down-wind quadrant North-Northwest of ASARCO. Samplers were placed to give adequate coverage of the area, although it is sparsely populated. The upwind area (South-Southeast of ASARCO) is relatively heavily populated and commercialized.

The high volume samplers were calibrated and operated in accordance with the reference method specified in the federal register. Sampling and equipment calibration and maintenance were performed by Texas air pollution control services personnel. Sampling was conducted continuously over approximately 24-hour intervals from April 23 to 1 June. Sampling periods for all Hi-Vols began between 0900-1500 hours and sampling was initiated at approximately the same hour daily for any given Hi-Vol.

Measured Pb levels were corrected from Pb derived from gasoline combustion (vehicle exhausts) by measurement of Br levels in the samples and application of the following correction: Pb (corrected) = Pb (measured) - (Br x 2.6); this correction was developed by the laboratory of the Texas air pollution control services. The corrected Pb levels, ranging from .03-.12 $\mu g/m^3$, are distributed randomly over the sampling area; no consistent relationship is indicated between Pb level and the proximity of the site to ASARCO. It cannot be concluded that emissions from ASARCO contribute significantly to measured Pb levels in the Amarillo area; these levels are attributable predominantly to vehicle exhausts.

Cadmium was not detected in some 40 percent of all samples analyzed. Mean Cd concentrations measured over the 39 day survey period ranged from .01-.05 $\mu g/m^3$. The maximum level was measured 1 mile north of ASARCO, but other concentrations (.01-.03 $\mu g/m^3$) were essentially randomly distributed over the survey area. It was shown by this sampling study that significantly higher Cd concentrations were measured in samples down-wind of ASARCO and that the concentration decreased somewhat with distance from ASARCO.

Arsenic was not detected in some 60 percent of all samples analyzed. Mean As concentrations measured during the 39 day survey period ranged from .01-.03 $\mu g/m^3$; concentrations were randomly distributed over the survey area. It was not demonstrated that samples taken down-wind of ASARCO had higher As concentrations than samples taken upwind.

Abundance and Distribution of Zinc, Lead, and Cadmium in Soils

An investigation of the abundance of zinc, lead, and cadmium in soils of the Amarillo area of Texas was undertaken. The purpose of this study was to determine the extent of contamination of the soils by emissions from ASARCO Amarillo.

It was concluded from this study that the concentration of lead, zinc, and cadmium in these materials is not found to be outside of the ranges found for normal soils across the U.S. Within a radius of five miles of the ASARCO Plant, the soils contain abundantly more lead and zinc than equivalent soils of the region. The levels also exceed the normal distribution in U.S. soils. Cadmium follows the same pattern out to about three miles. Zinc occurs in concentrations up to 6300 ppm, lead up to 540 ppm, and cadmium up to 22 ppm in the top four inches of soil. The concentrations are highest at 0.67 miles from the plant and fall off linearly on a log-log plot with distance from the plant.

Levels of Lead and Cadmium in Blood of School Children

Blood sampling for lead and cadmium was conducted on 180 students in four elementary schools of the Amarillo school system and one elementary school in Canyon. The study was statistically designed to determine possible differences in blood metal levels due to living location, sex, and time of sampling. A major assumption in the study is that the school location accurately represents the living location of the student.

Blood lead levels were found to range from 4 to 39 μg/100 ml whole blood with the average at 13.5 μg/100 ml there was no significant difference between test and control groups.

Blood cadmium levels ranged from below detectable limits to 2.78 μg/100 ml whole blood. The averages for the three major test areas varied widely. Students in sampled schools located nearest the stack had blood cadmium levels significantly higher than those at some distance from and assumed to be unaffected by the smelter. Students located four miles north of the plant (prevailing down-wind) showed a blood cadmium average level of .45 μg/100 ml. Students located approximately four miles east of the plant (minimal down-wind) had an average of .23 μg/100 ml cadmium. Students in Canyon (twenty miles south and presumably unaffected by the smelter) had blood cadmium levels averaging .08 μg/100 ml.

4.4 Texas Department of Agriculture

The Texas Department of Agriculture in 1970 recognized a need for detailed studies to define the extent of pesticide pollution in Texas streams. A monitoring study was thereby initiated with the dual purpose of defining geographic areas of high residue concentration, while following the movement of these residues in an attempt to identify the means by which pesticides are transported in the environment.

Silt samples were collected from a total of 50 stations on eight major Texas rivers and three smaller streams, encompassing the entire Eastern, North Central, Central, and Southern areas of the state. For convenience, the state was divided geographically into a Northern and Southern sampling region. Monthly sample collections were made alternately in each region, thus providing a two month interval between samples taken at each site. Ideally, six samples were collected from each site each year.

A total of 433 samples were taken over a 23 month period and 236 or 54.5 percent were positive for one or more pesticide residues. This total also includes non-pesticidal PCB residues. The frequency distribution of PCB residues is shown in Table 65 with the percentage and mean concentration.

TABLE 65

PCB's (μg/kg)

FREQUENCY OF OCCURRENCE AND MEAN CONCENTRATION

TOTAL POSITIVE SAMPLES	40
% FREQUENCY	17.3
MEAN CONCENTRATION	163.7

During the course of this study, the largest frequency for any residue other than DDT was for PCB compounds, which were found in 17.3 percent of all positive samples. (Table 65)

Aroclor residues, being chlorinated hydrocarbons, exhibit many of the properties of pesticide chemicals, including water insolubility and lipid insolubility, acute toxicity to marine species, biological magnification in the food chain, and persistence. For purposes of calculation in this study, Aroclor 1254 and Aroclor 1260 were consolidated under the general heading PCB.

A great deal of sampling was done in the Trinity River during the pesticide residue study. A comparison was made between rural and urban sites for pesticide and PCB residues. A comparison of PCB residues is shown in Table 66.

TABLE 66

TRINITY RIVER PCB RESIDUES:
A COMPARISON OF RURAL AND URBAN SITES

	RURAL	URBAN
NO. OF SAMPLES	33	51
NO. OF POSITIVE SAMPLES	6	18
% POSITIVE	18.2%	35.3%
MEAN CONCENTRATION (μg/kg)	78.9	244.5

It is evident from the data presented in Table 66 that significant PCB contamination does indeed exist in the urban areas and downstream samples reflect the PCB contamination that entered the river as it passed through the metropolitan area.

Table 67 compares the Trinity River with all other major rivers sampled, for frequency of positive samples, percentage of occurrence, and concentration. It is interesting to note that for all the sampling performed, 60 percent of all positive PCB samples occurred in the Trinity River. PCB's occurred in 17 positive samples where no pesticide residues were detected. PCB's were present in 54.5 percent of the positive Trinity River samples, while they were present in only 8.3 percent of all other samples taken.

TABLE 67

FREQUENCY OF OCCURRENCE AND MEAN CONCENTRATION OF PCB RESIDUES IN TRINITY RIVER SAMPLES COMPARED WITH ALL OTHER SAMPLES

TOTAL SAMPLES	40
TOTAL POSITIVE TRINITY RIVER SAMPLES	24
TOTAL POSITIVE ALL OTHER SAMPLES	16
% POSITIVE TRINITY RIVER SAMPLES OF TOTAL POSITIVE	54.5%
% POSITIVE ALL OTHER SAMPLES OF TOTAL POSITIVE	8.3%
MEAN CONCENTRATION (μg/Kg) OF TRINITY RIVER SAMPLES	20.3
MEAN CONCENTRATION (μg/Kg) OF ALL OTHER SAMPLES	62.8

It can be readily seen that point source contamination is apparently the cause of residues coming from the metropolitan urban areas of Ft. Worth and Dallas and that contamination proceeds downstream with the flow of the river. Identification of these sources was not within the scope of this study. Possible point sources would include pesticide formulation or pesticide plants, or from some industrial source other than a formulating plant.

In summary, this study has shown that metropolitan areas contribute significant quantities of pesticide and PCB contamination to streams and rivers and the greatest part of the contamination is likely to come from point source discharges.

5.0 CALIFORNIA AGENCY DATA ANALYSIS

5.1 California State Department of Health - Epidemiological Studies Laboratory

The above agency published a report entitled: "Food Chain and Health Implications of Airborne Lead" in 1975. A discussion of the survey and its findings follows.

In January 1970, lead poisoning among horses in the Carquinez Strait Area led to questions as to whether lead in air might be affecting human food supplies in that area or elsewhere in California. This added further urgency to the Department's interest in seeing whether sensitive methods could be applied to distinguishing blood lead levels in population samples of California adults and children.

Air samples and food samples, reflecting usual purchase and consumption habits, were obtained in five areas. In addition, blood and urine samples from adults and children were obtained and analyzed for lead or for metabolic evidence of lead exposure. The five communities that were used in this study represented high and low lead exposure areas. Benicia and Crockett were chosen to represent relatively high exposure in Northern California, partly because of the relatively high exposure to lead suggested by the high levels of lead found in vegetation sampled in the area, and partly as a result of the concern for the effects on human health of the exposure through the food chain which was believed to be a cause of the horse deaths in the Benicia area. Alpine County was chosen for an area of low exposure because it had previously been shown to yield relatively low levels of lead in blood and urine obtained from residents. In Southern California, Burbank and Manhattan Beaches were chosen as areas of high and low exposure, respectively. In addition to the study conducted in these five areas, this report also discussed and presented data on a six community study in Los Angeles and a housing study in San Diego, both dealing with blood lead levels. Avena (vegetation) sampling was also conducted in Manhattan Beach.

Population Sampling in Five Area Study

The household samples and successful contacts for population sampling are shown in Table 68. Alpine County is not on this table since their data had already been received. The results of the sampling of adults and children are shown in Tables 69 and 70.

When men and women in Benicia and Crockett are compared with respect to blood lead, the Crockett populations have significantly higher values. The sources might have been via food in the past or it may reflect respiratory exposure. It was not due to occupational exposure, for occupationally exposed individuals were not included. The levels observed were not in the range likely to be clinically important. No significant differences in blood lead in children from Benicia and Crockett were noted.

Significant differences in blood lead from both male and female children were observed between Burbank and Manhattan Beach. Burbank boys have mean blood lead slightly greater than 23 μg/100 g and girls greater than 20 μg/100 g, both of which exceed the "acceptable biological limits" proposed for groups of children by Zielhuis.[1]

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[1] Lead Absorption and Public Health: An Appraisal of Hazards International Symposium: Environmental Aspects of Lead, Amsterdam, October 2-6, 1972.

TABLE 68

HOUSEHOLD SAMPLES AND SUCCESSFUL CONTACTS

HOUSEHOLD SAMPLE	BENICIA	CROCKETT	MANHATTAN BEACH	BURBANK
Number of Housing Units	194	160	205	201
Vacant housing units	8	4	1	5
Unable to locate occupant	9	0	10	31
Contacts made	177	156	194	165
Refused interview	13	17	23	25
Screening criteria not met	75	38	41	24
Less than 3 yrs. residence	55	26	24	19
Occupational exposure to lead	20	12	17	5
Past lead poisoning	0	0	0	0
Interviews completed	89	101	130	116
No specimens collected	37	50	89	73
Specimens collected	52	51	41	43

Source: California Department of Health

TABLE 69

SUMMARY OF LABORATORY RESULTS
SPECIMENS FROM ADULTS

ANALYSIS	MALE					FEMALE				
	Alpine	Benicia	Crockett	Burbank	Manhattan Beach	Alpine	Benicia	Crockett	Burbank	Manhattan Beach
Blood Lead(μg/100 g)										
N	15	27	20	20	22	20	25	31	22	19
Mean	15.40	16.30*	20.75*	16.85	15.32	11.75	11.76**	14.29**	15.45	13.79
S.E. of Mean	1.51	0.79	2.21	1.00	0.84	1.05	0.40	0.55	0.82	0.83
ALAD Units										
N	NA	26	20	NA	NA	NA	25	31	NA	NA
Mean	NA	100.92*	71.25*	NA	NA	NA	127.16	110.06	NA	NA
S.E. of Mean	NA	7.97	7.50	NA	NA	NA	7.40	6.68	NA	NA
Urine Lead (μg/100ml)										
N	10	26	20	17	21	3	21	30	16	17
Mean	1.74	1.21*	2.04*	2.16	1.64	2.97	1.30	1.46	1.94	1.39
S.E. of Mean	0.19	0.67	0.25	0.24	0.12	1.52	0.18	0.14	0.22	0.17
D–ALA (μg/100 ml)										
N	10	26	20	20	22	5	23	31	21	19
Mean	0.27	0.16	0.16	0.21	0.25	0.30	0.23*	0.17*	0.23	0.17
S.E. of Mean	0.03	0.02	0.02	0.03	0.03	0.06	0.02	0.02	0.03	0.03

* Differences between means are significant at the 5% level.
** Differences between means are significant at the 1% level.

NA Not available.

Note: Signicance tests refer to differences between means for Benicia–Crockett and Burbank–Manhattan Beach.

Source: California Department of Health

TABLE 70
SUMMARY OF LABORATORY RESULTS
SPECIMENS FROM CHILDREN

ANALYSIS	MALE				FEMALE			
	Benicia	Crockett	Burbank	Manhattan Beach	Benicia	Crockett	Burbank	Manhattan Beach
Blood Lead(μg/100 g)								
N	17	18	17	21	17	10	19	19
Mean	13.12	14.33	23.29**	16.81**	13.71	13.80	20.37**	17.05**
S.E. of Mean	0.64	0.89	1.14	0.88	0.76	1.53	0.67	1.00
ALAD Units								
N	14	18	NA	NA	16	10	NA	NA
Mean	116.50	94.61	NA	NA	111.60	100.50	NA	NA
S.E. of Mean	9.42	9.62	NA	NA	6.33	11.36	NA	NA
Urine Lead (μg/100 ml)								
N	19	14	NA	NA	14	6	NA	NA
Mean	2.70	2.24	NA	NA	2.35	3.13	NA	NA
S.E. of Mean	0.22	0.27	NA	NA	0.24	0.33	NA	NA
D-ALA (μg/100 ml)								
N	20	18	NA	NA	17	10	NA	NA
Mean	0.33	0.31	NA	NA	0.31	0.30	NA	NA
S.E. of Mean	0.04	0.02	NA	NA	0.02	0.03	NA	NA

** Differences between means significant at the 1% level.

NA Not available.

Note: Significance test refer to differences between means for Benicia - Crockett and Burbank - Manhattan Beach.

Source: California Department of Health

It should be noted that the California laboratory methods may not be strictly comparable with those used in defining the Zielhuis standards. Also, the California blood lead results are reported in μg/100 g. These should be multiplied by a conversion factor of about 1.05 to give results for comparison with the Zielhuis standards, which are expressed as μg/100 ml. Zielhuis' standards are shown in Table 71.

Food Chain Hazards in Five Area Study

Food intake was sampled by purchasing common food items from local grocery stores and by obtaining samples of food grown in backyard gardens in each area. Results of interviews were used to determine whether diets differed appreciably in the different locations and to determine which grocery stores were used most frequently. Comparable items of food could not be obtained consistently in all areas because of differences in seasonal or local availability and problems of transportation and storage. Lead concentrations in some common food items obtained from most areas are shown in the summary tables (Tables 72 and 73), and no consistent area differences can be detected. When more than one sample was obtained from an area, values for each sample are shown. Considerable variation occurred between different food items as well as between different samples of the same food. The highest concentration of lead was reported to occur in carrot greens from a backyard garden in Benicia (5.60 μg/g). Other vegetables with high values were chard, parsley, lettuce, mustard greens, and spinach, with concentrations

TABLE 71

ZIELHUIS' STANDARDS*

ADULTS

INDIVIDUAL UPPER LIMIT	GROUP AVERAGE	UNIT
PbB ≤ 40	≤ 25	μg Pb/100 ml
ALAU ≤ 6	≤ 3	mg/1 urin
ALAD ≥ 20	≥ 30	procentual decrease from 100% (at PbB = 10 μg Pb/100 ml)

CHILDREN

INDIVIDUAL UPPER LIMIT	GROUP AVERAGE	UNIT
PbB ≤ 35	≤ 20	μg Pb/100 ml
ALAU ≤ 5	≤ 3	mg/1 urin
ALAD ≥ 30	≥ 40	procentual decrease from 100% (at PbB = 10 μg Pb/100 ml)

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*Guidelines presented by Zielhuis at International Symposium on Environmental Aspects of Lead, Amsterdam, October 2-6, 1972.

TABLE 72
COMPARISON OF LEAD CONCENTRATIONS IN FOOD BY AREA
(µg/g for individual samples)

	ALPINE	BENICIA	CROCKETT	BURBANK	MANHATTAN BEACH
FRUIT					
Apples	.15 .20	.09 .09 .02	< .01	.08 .03 .03 .06 .04 .07 .06	.05 .05
Tomatoes	.02 .18	< .01	< .01	.02	.02
Oranges	NA	.12 .08	.06 .08	.04 .10 .05 .04	.05
VEGETABLES					
Lettuce	.05	NA	.54	.04 .26	.10
Parsley	.20	.66 .88	.24	1.25	.49
Spinach	.32	.23	.85	.69	.42
Romaine	.26	.09 .40	.08	.35	.15
Celery	.04	NA	.00	.05	.12
Eggplant	.02	.05 .05	.02	NA	.03
Carrots	.31 .12	.12 .10	< .01	.03	.17
Potatoes	.02 .04	.09 .13	.02	.05 .05 .03	.05

NA: Not available

Source: California Department of Health

TABLE 73
COMPARISON OF LEAD CONCENTRATIONS IN FOOD BY AREA
(μg/g for individual samples)

	ALPINE	BENICIA	CROCKETT	BURBANK	MANHATTAN BEACH
MEAT					
Ground Beef	.16	< .03	.12	.08(x2) .09(x2)	.07
Chicken	.16 .42	< .03 .16	.10	.10	.09
Bacon	.30 .06	.20 .44	.28	.03	.24
Ham	.84 .08	.13 .32	.22	.11	.16
Lamb Chops	.10 .16	.18 < .03	.17	.08	.25
Pork Chops	.16 .19	.27 .38 < .03	.15	.10	.07
DAIRY					
Butter	.12	.45 .17	.05	.09	.05
Milk	< .01 .08	.03 .06	.06	.07	.03
Eggs	.02	.12 .04	.08	.05	.07
Cottage Cheese	NA	.06	.08	.15	.04
GRAIN PRODUCTS					
Bread	.18	.83 .63	NA	.10	.13
Margarine	.52	.08 .13	NA	.06	.06

NA: Not available
x2: Two samples each

Source: California Department of Health

ranging from 0.85 - 2.41 μg/g. Table 74 displays a comparison of lead concentrations in backyard garden produce by area. Other foods showing relatively high concentrations of lead were anchovies and anchovy paste, veal kidney, top round, tuna, and ham, with values ranging from 0.84 to 2.00 μg/g.

The Bureau of Radiological Health routinely collects samples of hospital diets for surveillance of background radiation. Each sample consists of all food and beverages from a hospital tray as it is served to patients, including all liquids. Twenty-four samples from throughout the State were analyzed for lead concentration. The values were uniformly low and range from <0.01 μg/g to 0.17, all but three of the values being less than 0.10.

No evidence was found that a significant amount of lead would be ingested through the food chain, nor were significant area differences detected.

Air Monitoring in Five Area Study

Tables 75 and 76 display the air monitoring data obtained during the monitoring program.

Table 77 shows a summary of the air monitoring data. High volume sampling stations were set up within each of the residential areas studied. The mean lead concentrations by quarter for Burbank are consistently higher than the comparable means for Manhattan Beach, but only the differences for the second quarter of 1972 are statistically significant using a two-tailed t-test ($p > 0.05$). The

TABLE 74
COMPARISON OF LEAD CONCENTRATIONS IN BACKYARD GARDEN PRODUCE BY AREA
(μg/g for individual samples)

	BENICIA AND CROCKETT	BURBANK	MANHATTAN BEACH
Apples	NA	.24 .23	.07
Carrots	.47 .16 .18	.30 .06	.07
Zucchini	.19 .07 .05 < .04	.02	.02
Chard	.15 .29 2.41	.30	.57
Lettuce	NA	.70	.42
Bell Peppers	.08 .03 .18 .05 < .09	.10	.02
Tomatoes	.08 .01 .07 .06 .12	.04	.02 .04
Cherry Tomatoes	NA	.04	.03
Figs	.29 .09 .26	.18	.16
Lemons	.21 .14	.09 .08 .08 .06	.06
Strawberries	.47	NA	.45

NA: Not available

Source: California Department of Health

TABLE 75
AIR MONITORING DATA HI VOL SAMPLER
($\mu g/m^3$)

Burbank and Manhattan Beach

	24-Hours Starting	Lead Concentration			24-Hours Starting	Lead Concentration	
		Burbank	Manhattan Beach			Burbank	Manhattan Beach
Third Quarter October, 1971	9	3.33	2.94	First Quarter January, 1972	12	10.506	5.485
	10	1.09	2.81		13	5.405	2.565
	11	3.91	0.80		14	8.907	7.002
	14	1.47	0.65		17	5.803	1.736
	15	0.49	0.37		18	4.763	1.589
	16	0.55	1.27		19	7.831	3.389
	17	0.91	2.11		24	3.909	3.975
	18	1.67	2.77		25	2.224	0.862
	20	2.89	3.36		26	3.622	2.019
	21	5.24	5.00		27	2.910	2.273
	22	4.06	2.77		28	7.016	5.968
	23	1.57	1.95		29	4.159	6.611
	24	1.18	0.95		30	3.893	4.082
	25	2.12	0.67	Second Quarter April, 1972	4	5.948	1.624
	26	1.71	1.09		5	3.144	0.617
	27	1.15	0.42		6	2.551	1.055
	28	0.23	0.83		17	1.283	0.270
	29	1.42	1.52		18	1.462	1.262
	30	2.25	0.98		19	3.251	3.076
	31	2.48	1.92		20	5.062	1.554
November, 1971	1	2.20	1.78		21	4.524	2.867
	2	2.82	2.55		22	3.811	1.507
	3	1.96	2.80		23	1.635	4.850
	4	4.85	2.25				
	5	6.32	4.91				

Source: California Department of Health

TABLE 76
AIR MONITORING DATA HI VOL SAMPLING
($\mu g/m^3$)

Benicia and Crockett

	24-Hours Starting	Lead Concentration			24-Hours Starting	Lead Concentration	
		Benicia	Crockett			Benicia	Crockett
Third Quarter				First Quarter			
September, 1972	3	0.11	0.19	January, 1973	1	0.18	0.24
	9	0.16	0.15		7	0.79	0.16
	21	0.22	0.33		13	0.12	0.05
	27	0.22	0.32		19	0.26	0.20
					25	0.06	0.03
Fourth Quarter					31	0.14	0.13
October, 1972	3	0.15	0.42	February, 1973	6	0.17	0.28
	15	0.38	0.14		12	0.42	0.12
	21	0.43	0.48		18	1.01	0.35
	27	0.19	0.25		24	0.21	0.11
November, 1972	8	0.61	0.25	March, 1973	2	0.38	0.23
	14	0.15	0.12		8	0.25	0.21
	26	0.46	0.21		14	0.60	0.55
December, 1972	8	0.43	0.11		20	0.13	0.10
	20	0.23	0.18		26	0.19	0.16
	26	0.25	0.34				
				Second Quarter			
				April, 1972	1	0.16	0.18
					13	0.17	0.16
					19	0.13	0.16
					25	0.32	2.22

Source: California Department of Health

TABLE 77
SUMMARY OF AIR SAMPLING DATA
$(\mu g/m^3)$

Time Interval	Burbank			Manhattan Beach		
	N	Mean	S.E.	N	Mean	S.E.
Fourth Quarter, 1971 10/8 - 11/7	25	2.315	0.312	25	1.979	0.253
First Quarter, 1972 1/12 - 1/30	13	5.458	0.684	13	3.658	0.569
Second Quarter, 1972* 4/4 - 4&23	10	3.267	0.502	10	1.868	0.432

Time Interval	Benicia			Crockett		
	N	Mean	S.E.	N	Mean	S.E.
First Quarter, 1972 2/7 - 3/23	8	0.741	0.211	8	0.598	0.140
Second Quarter, 1972 3/30 - 6/29	9	0.211	0.052	11	0.317	0.088
Third Quarter, 1972** 7/5 - 9/27	14	0.195	0.018	15	0.303	0.033
Fourth Quarter, 1972 10/3 - 12/26	10	0.328	0.049	10	0.250	0.040

* Difference between means significant at 5% level, two-tailed t-test.
** Difference between means significant at 1% level, two-tailed t-test.

Source: California Department of Health

differences between means for Benicia and Crockett are not consistent in direction, and the only statistically significant difference using a two-tailed t-test is for the third quarter of 1972 ($p < 0.1$).

The consistently higher mean values in Burbank when compared to Manhattan Beach suggest that these differences could be a factor in the higher blood lead concentrations found among Burbank children. This is supported by comparisons of the values for individual days, which also show a marked tendency for Burbank values to be higher than those reported from Manhattan Beach. Results of sign tests were significant at the 5 percent level for the first and second quarters (6 out of 6, and 9 out of 10 differences, respectively, showing higher values for Burbank than for Manhattan Beach) while a similar test for all three quarters combined was significant at the 1 percent level (31 out of 41 differences showing higher values for Burbank).

The significantly higher mean value in Crockett when compared to Benicia (second quarter, 1972) corresponds to the significantly higher blood lead means found among adults in Crockett.

However, the relative lack of consistency in direction of differences for individual days, as well as the uniformly low values, suggests the lack of a significant human effect, at least from inhaled air. The possibility of air exposure to lead on soil and vegetation is a different problem.

Avena Sampling in Five Area Study

It was originally planned that Avena be used in this study as a supplemental method of indicating exposure to airborne lead. However, Avena was not generally available in the Alpine County Study area nor in the Burbank Area. Several Avena samples were collected in the Manhattan Beach Area. The results of these analyses are shown in Table 78.

Six-Community Study in Los Angeles

The six community study in Los Angeles was designed to compare the effects of air pollution on lung function and other indicators in communities representing high, moderate, and low exposure. Two communities were chosen to represent each exposure level. Results reported here are limited to blood lead concentrations in elementary school boys and girls, mostly 10 years old, and in male high school athletes (Table 79). In most cases, male-female differences among the elementary school children were slight, although males showed consistently higher concentrations than females. No consistent differences were observed between elementary school children and high school students. The lowest mean concentrations of lead occurred in the two low pollution communities for both elementary and high school students, but the highest mean value in elementary school students occurred in an area of moderate pollution. Means from the two high pollution areas combined (Riverside and Azusa) and the two low pollution areas combined (Lancaster and Oceanside) were

TABLE 78

CONCENTRATION OF LEAD AND CADMIUM IN AVENA

Manhattan Beach

April, 1972

Specimen	Lead (μg/g)	Cadmium (μg/g)
MB1	133	<.4
MB2	23	<.5
MB3	32	<.5
MB4	64	<.5
MB5	<7	<.4
MB6	21	<.5
MB7	12	<.5
MB8	<8	<.5
MB10	14	<.5

Source: California Department of Health

TABLE 79
BLOOD LEAD CONCENTRATION ($\mu g/100\ g$) BY LOCATION AND SEX
SIX–COMMUNITY STUDY OF SCHOOL CHILDREN
SOUTHERN CALIFORNIA

POPULATION	HIGH POLLUTION		MODERATE POLLUTION		LOW POLLUTION	
	Riverside	Azusa	Long Beach	Culver City	Lancaster	Oceanside
Elementary School						
Male						
N	27	18	22	28	10	24
Median	11.0	11.0	11.0	14.0	8.0	10.5
Mean	12.1	12.6	11.4	14.6	9.2	10.8
S.E. of Mean	0.6	0.7	0.6	0.8	1.0	0.5
Female						
N	23	23	24	21	28	19
Median	11.0	12.0	10.0	12.0	8.0	9.0
Mean	11.4	12.0	10.7	12.4	8.5	9.8
S.E. of Mean	0.5	0.7	0.6	0.6	0.4	0.5
High School						
Male						
N	17	23	30	19	20	26
Median	11.0	14.0	12.0	13.0	9.0	9.5
Mean	12.1	14.6	12.6	14.0	9.0	10.1
S.E. of Mean	1.0	0.6	0.5	0.6	0.5	0.6

Note: Differences between pooled means for the high and low pollution areas were statistically significant at the 1% level for both high school and elementary school differences.

Source: California Department of Health

tested for each sex for statistically significant differences. Both high school and elementary school differences were significant at the 5 percent level.

Housing in San Diego

Population samples of preschool children were chosen in several areas of San Diego County representing pre-World War II housing containing lead-based paint. These included east San Diego, representing whites with non-Spanish surnames, and others who were not of low economic status; Southeast San Diego, representing low economic status and a variety of ethnic backgrounds; National City, representing low economic status and with all but two individuals in the sample having Spanish surnames; Pala, an Indian reservation; Escondido, with a sample consisting entirely of individuals with Spanish surnames; and Oceanside and Carlsbad represented by one child each.

East San Diego, southeast San Diego, and National City were each represented by children who could be classified as living near traffic or away from traffic. Boundaries between "near" and "away from" traffic were set to coincide with divisions between city blocks. "Near" was within 380 feet of traffic; "away from" was between 380 and 700 feet. Differences between mean blood lead concentrations in the groups living near and away from traffic were tested separately for each of these three areas and for all three areas combined using a two-tailed t-test. The only statistically significant difference was for National City ($p < 0.05$). These results, along with mean values for other areas, are shown in Table 80. There were no mean values or individual values that exceeded the suggested limits from the Amsterdam Symposium.

Lead concentrations in soil ranged from 45 ppm to 2256 ppm. A rank correlation test (Spearman's rho) was used to determine whether there existed a significant correlation between blood lead concentration and concentration of lead in soil from corresponding play areas, either within any of the study areas or for all areas combined. The results were not statistically significant at the 5 percent level. For all areas combined, a median test was done to determine whether significant differences in soil lead concentration occurred between samples collected from households near traffic compared with those away from traffic. These results, also, were not statistically significant at the 5 percent level.

TABLE 80

San Diego County Study of School Children
Comparison of Mean Blood Lead Concentrations

µg/100g

	Total			Away From Traffic			Near Traffic		
	N.	Mean	S. E.	N.	Mean	S. E.	N.	Mean	S. E.
Total, Three Areas	74	15.9	0.57	26	15.2	1.03	48	16.3	0.68
East San Diego	20	15.6	0.82	8	17.4	1.46	12	14.4	0.83
Southeast San Diego	34	17.1	0.93	11	16.2	1.79	23	17.5	1.09
National City	20	14.2	1.08	7	11.0*	1.11	13	16.0*	1.33
Pala	4	11.2	2.02	4	11.2	2.02	-	-	-
Escondido	5	12.2	1.98	5	12.2	1.98	-	-	-

*Difference between means statistically significant ($p < 0.05$, two-tailed t-test).

Source: California Department of Health

5.1.1 California State Department of Health - Interagency Committee on Environmental Mercury

Mercury contamination in the environment has become apparent over the past few years. To study the effects of mercury pollution in California, the Interagency Committee on Environmental Mercury was formed. The committee has studied samples gathered from fish, game birds, water, sediments, and waste water.

The fish data that was analyzed showed that over 30 percent of the fish sampled had mercury residues exceeding the 0.5 ppm federal tolerance level. Values ranged from 0 to 1.27 ppm, with an average mean value of 0.27 ppm (Table 81).

Analyses that were performed on game birds, water, sediments, and waste water were not conclusive. No trends were evident with the exception of the water supply samples. A majority of these samples showed mercury content below the detectable limits. More testing will have to be done before any conclusions can be drawn.

5.1.2 Mercury Residues in Harbor Seals

Ten samples were taken from harbor seals living in California coastal waters. These samples were analyzed for content of mercury, lead, and cadmium (Table 82 displays results).

Mercury results showed a high value of 3.1 ppm, a low value of 0.23 ppm, and an average value of 1.139. Lead values were 3.2 ppm for high, 0.10 for low, and 0.525 for a mean, while the high cadmium value was 0.76 ppm, low value was 0.01 ppm, and average was 0.116 ppm.

TABLE 81

MERCURY RESIDUES IN FISH FROM CALIFORNIA (ppm)

APRIL - JULY 1970

SPECIES	NO. OF SAMPLES	RANGE	MEAN	STANDARD DEVIATION
Striped Bass	29	0.06-1.27	0.50	0.306
Sturgeon	12	0.08-.8	0.25	0.235
Shad	3	0.0-0.06	0.03	-
Catfish	41	0.0-1.18	0.27	0.269
Largemouth Bass	5	0.0-0.76	0.25	-
Squawfish	10	0.11-1.16	0.36	0.337
Carp	3	0.29-1.16	0.56	-
Bluegill	17	0.08-0.71	0.30	0.158
Rainbow Trout	14	0.03-0.21	0.09	0.054
Brown Trout	1	0.36	-	-
Sucker	1	0.29	-	-
Crappie	1	0.23	-	-
Shark	2	0.52-.52	0.52	-
Rex Shark	4	0.08-0.12	0.1	-
Sand Dab	3	0.11-0.15	0.12	-
Halibut	3	0.07	-	-
King Salmon	1	0.07	-	-
Oysters	1	0.06	-	-

Source: MITRE analysis.

TABLE 82

HEAVY METAL RESIDUES IN HARBOR SEALS (ppm)

METAL	NO. OF SAMPLES	RANGE	MEAN
MERCURY	20	0.23 - 3.10	1.139
LEAD	17	0.10 - 3.20	0.525
CADMIUM	17	0.01 - 0.76	0.116

Source: MITRE analysis.

5.2 Universities in California

5.2.1 University of California - Lawrence Livermore Laboratory

An article from the University of California entitled: "Lead Source Identification by Multi-Element Analysis of Diurnal Samples of Ambient Air" describes the development of a method for determining the existence and nature of non-automotive lead sources in a given area from ambient air particulate samples. The method consists of first measuring the diurnal variations of the Br/Pb ratio using x-ray flourescence to determine those days on which the non-automotive lead source is operating. For the episodal days the diurnal concentration patterns of about 20 metals are measured using neutron activation analysis. The correlation of these patterns with the lead pattern characterizes the source. The method has been tested in Benicia, California and has successfully established the existence of a non-automotive lead source in that area and characterized the type of source.

From November of 1970 to March 1, 1971, the air was monitored in Benicia in two-hour time intervals for three days each week with the anticipation that the analysis of the concentration variations of many elements might answer three questions:

1) Is some of the Pb in the air of non-automotive origin?
2) In what direction with respect to the sampler are the sources located?
3) What is the nature of these sources?

Although most of the sampling data obtained indicated that the lead values were attributable to automotive emissions, the x-ray flourescence analysis selected three days as candidates for days on which a major component of the Pb aerosol was from a non-automotive source. To establish that this was the case and actually to determine the nature of the non-automotive source, a multi-element analysis on all the samples for these three days was carried out using neutron activation analysis. Table 83 shows the elemental concentrations at the episode peaks. The data in Table 83 not only confirm the existence of a non-automotive Pb source but also determined the nature of the source. The correlated elements for the three episodes described would be consistent with a smelter source. There is in fact a smelter in the area located about two miles WSW from the sampler with stacks 100 ft and 600 ft high. In April of 1970 a source test of the 600-foot stack was carried out by the Bay Area Air Pollution Control District. The results which were given in lbs/day are presented in Table 84 normalized to arsenic to make meaningful comparisons with the diurnal data of this experiment. The qualitative agreement between stack and ambient air data further implicated the smelter as the source of the episodes on these three days.

TABLE 83

CONCENTRATIONS AT EPISODE PEAK FOR CORRELATED ELEMENTS, NANOGRAM/M^3

ELEMENT	2100 11/16/70	0900 12/10/70	0300 1/21/71
Pb	4150	9400	4500
Zn	1160	1770	1840
Hg	44	630	45
Ba	33	104	35
Se	11	82	5
As	176	630	1400
Sb	97	148	760
In	3.1	8.6	1.9
Ag	4.5	175	58
Cd	290	<30	<30

TABLE 84

COMPARISON OF TYPICAL STACK SAMPLE CONCENTRATIONS WITH AMBIENT AIR SAMPLE CONCENTRATIONS AT EPISODE PEAK NORMALIZED TO ARSENIC

ELEMENT RATIO	STACK	NOV 16-17	DEC 9-10	JAN 20-21
As/Zn	0.31	0.15	0.36	0.76
As/Pb	0.17	0.042	0.067	0.31
As/Cd	0.40	0.61	-	-

5.2.2 Scripps Institution of Oceanography, University of California, San Diego

The following are abstracts from published research done at Scripps. Copies of the reprints are at EPA.

1. Lead Accumulation in Roadside Soil and Grass

Soil and grass samples taken along U.S. Highway 1 in Maryland were checked for lead content. Lead accumulation was highest on the top layer of soil and decreased at lower depths. Traffic and wind pattern also determined lead content.

2. Lead and Uranium in Pennsylvanian Anthracite

Lead has been found in Pennsylvanian anthracites. It was determined that this lead was embodied prior to coalification while uranium came after coalification.

3. Occurrence of Lead in Tuna

The validity of lead concentration measurement in water and fish (including shellfish) was found to be unreliable. These measurement techniques of atomic absorption and anodic stripping voltammetry have been in error by factors of 10 to 100. A reliable technique has now been determined, finding that lead in muscle is four times lower in value than lead in epidermis.

4. Lead Pollution: Records in Southern California Coastal Sediments

Lead in coastal sediments comes mainly from combustion of lead additives in gasoline.

5. Our Daily Lead

Dr. Chow discusses the distribution of lead in our environment and discusses how the U.S. Government is combatting this lead pollution.

6. History of Metal Pollution in Southern California Coastal Zone

This outline discusses metal content fluctuation in coastal California sediments.

7. Mercury in the California Environment

Mercury has been found in fish from both fresh and estuarine water bodies. Sport fish had elevated levels of mercury in their flesh while most commercial fish and shellfish had only minor mercury traces.

8. Lead Aerosol Baseline: Concentration at White Mountain and LagunaMountain, California

This article states that lead aerosol concentration at White Mountain should be used as present baseline concentrations for atmospheric lead in the continental U.S.

9. Lead Isotopes in North American Coals

Lead isotopes in North American coals are equally or more radiogenic than those in present continental crust.

6.0 MICHIGAN AGENCY DATA ANALYSIS

6.1 Michigan Department of Natural Resources

6.1.1 Wildlife Division

The Wildlife Division is responsible for monitoring wildlife for levels of toxic substances. The Division monitored two of the toxic substances of interest--mercury and PBB.

From June through October of 1974, pheasant samples were tested and found to contain levels of PBB. These levels were found in samples of game farm adult breeders, in eggs produced by these breeders, and in young pheasants hatched from eggs produced by the breeders.

The Michigan Department of Agriculture Laboratories performed the analyses and determined that feed manufactured by the Farm Bureau Services contained PBB, and this feed was fed to the pheasants, causing subsequent PBB contamination.

As a result, examination of the pheasant samples (fat was used when available, in all other cases breast muscle was used) displayed levels of PBB contamination. Findings showed a relationship between animal age and a level of PBB concentration; the older the animal, the higher the concentration (Table 85).

The Wildlife Division also monitored various species of birds and mammals for mercury content. Included were breast muscle samples from pheasants, miscellaneous birds and mammals, and various types of ducks. Data is shown in Table 86).

Only two different analyses of ducks showed mean mercury levels

TABLE 85

LEVELS OF PBB IN MICHIGAN PHEASANTS (ppm)

JUNE-OCTOBER 1974

TYPE OF SAMPLE	NO. OF SAMPLES	RANGE	MEAN
Male Adult Breeder Pheasants	6	0.49 - 6.1	2.455
Female Adult Breeder Pheasants Analysis 1	6	0.16 - 4.422	1.223
Female Adult Breeder Pheasants Analysis 2	5	0.12 - 1.7	0.896
Pheasant Eggs	5	0.091 - 0.175	0.113
Young Pheasants	18 13 were 0	0.002 - 0.202	.034

TABLE 86

MERCURY IN MICHIGAN WILDLIFE (ppm)

TYPE OF SAMPLE	DATE	NO. OF SAMPLES	RANGE	MEAN
Miscellaneous Birds and Mammals Muscle	1969-1970	38	0.01 - 0.69	0.1265
Pheasant Breast Muscle	2/70-4/70	19	0.01 - 0.64	0.1373
Puddle Ducks Breast Muscle Fall Samples	Fall 1969	32	0.015 - 0.595	0.150
Puddle Ducks Breast Muscle Late Spring & Summer Samples	1968-1970	13	0.101 - 0.401	0.244
Detroit River Ducks Pte. Mouillee	---	20	0.060 - 0.779	0.26
Lake St. Clair Harsen's Island Ducks	---	16	0.040 - 0.699	0.259
Duck Breast Muscle	4/1970	39	0.01 - 1.76	0.653
Puddle Ducks Early Spring Samples	4/1970	13	0.03 - 0.589	0.234
Diving Ducks Fall Samples	Fall 1969	35	0.032 - 1.299	0.274
Diving Ducks Spring Samples	4/1970	32	0.18 - 1.76	0.761

TABLE 87
MICHIGAN WATER RESOURCES COMMISSION
1973 SURVEILLANCE DATA

TOXIC SUBSTANCE	TOTAL NO. OF PLANTS	POUNDS DISCHARGED BY PLANT PER YEAR							
		0 lbs	211 lbs	11-100 lbs	101-500 lbs	501-1000 lbs	1001-10,000 lbs	10,000-100,000 lbs	100,000 lbs
ARSENIC	85	21	49	9	6				
CADMIUM	149	36	78	25	6	1	3		
CHROMIUM	440	66	132	92	79	26	35	9	1
LEAD	199	57	71	30	17	12	11	1	
MERCURY	99	34	58	5	2				
CYANIDES	257	45	100	48	31	14	15	4	
PCB	39	17	15	6	1				

greater than the 0.5 ppm U.S.-FDA limit. Other mean values were well below the federal limits.

6.1.2 Department of Natural Resources, Bureau of Water Management Water Resources Commission

The Comprehensive Studies Section (CSS) of the Water Resources Commission expanded its water quality monitoring Programs in 1972. Instead of five separate programs, a single river monitoring effort began. This new effort included a total of 291 stations.

The CSS provided a complete list of all the sampling locations, along with the appropriate STORET numbers.

Table 87 shows the results of the 1973 surveillance data. Seven of the eight toxic substances of interest were included on the Michigan list of critical materials (beryllium was missing).

6.1.3 Michigan Department of Natural Resources - Division of Air Pollution Control

The Michigan Division of Air Pollution Control submitted heavy metal air data for 1974 for two high volume sites, Macomb Company and Grand Rapids, Michigan. This data was obtained by sampling every six days for a 24-hour sampling period. The heavy metals of interest were lead, cadmium, and beryllium. These data were transferred to SAROAD daily data forms, keypunched, and analyzed with MITRE's statistical computer program. The results of the data analysis are shown in Appendix A.

6.2 Michigan Department of Public Health

The Department of Public Health is responsible for monitoring all municipal water supplies in the state of Michigan. Samples are recorded on a monthly or seasonal basis and stored for a period of time up to ten years.

The Department provided the procedures for recording and storing the water data and included a tabulation of selected analyses.

These analyses were performed during the past year. Eleven sites were included and seven of the eight toxic substances of interest were determined.

Results showed that all the water submitted for analysis contained no toxic substances above the detectable limits as can be seen in Table 88. PCB's and PBB's were not generally detected and only one supply, Harrison, showed the presence of PBB which was less than the lowest limit of 0.1 ppb. There was no trace of beryllium in any of the water supplies.

6.3 Wayne County Department of Health-Trace Metal Data

The Wayne County Health Department runs Hi-Vol samplers for particulate samples every 6 days for a 24-hour sampling period. The atmospheric metal data displayed in Tables 89 and 90 was derived from the suspended particulate data on a quarterly composite basis using atomic absorption spectroscopy. These data were taken from the 1972 and 1973 annual reports provided by the Wayne County Health Department.

TABLE 88

DETECTION LIMITS FOR TOXIC SUBSTANCES IN MICHIGAN DRINKING WATER

Toxic Substance	Detection Limit
arsenic	10 ppb
beryllium	not specified
cadmium	10 ppb
chromium	10 ppb
cyanide	10 ppb
lead	50 ppb
PBB	not specified
PCB	not specified

TABLE 89

ATMOSPHERIC METALS - 1972

WAYNE COUNTY, MICHIGAN

	STATION						
	01	04	05	06	012	32	34
CADMIUM ($\mu g/m^3$)							
1972 JAN-MAR	.1076	.0039	.0077	.0021	.0047	.0102	.0046
APR-JUN	.0055	.0055	.0051	.0064	.0051	.0101	.0037
JUL-SEP	.0034	.0034	.0038	.0017	.0018	.0078	.0034
OCT-DEC	.0055	.0037	.0055	.0019	.0034	.0038	.0046
BERYLLIUM (nanograms/m^3)							
1972 JAN-MAR	0	trace	trace	trace	trace	trace	0
APR-JUN	trace	trace	trace	0	0	trace	0
JUL-SEP	trace	trace	trace	trace	trace	trace	trace
OCT-DEC	trace	trace	trace	trace	trace	trace	trace
LEAD ($\mu g/m^3$)							
1972 JAN-MAR	.80	1.13	1.29	.71	.39	.79	.75
APR-JUN	.87	1.18	.96	.93	.47	.94	.43
JUL-SEPT	.92	1.32	.64	.58	.49	.66	.46
OCT-DEC	.74	.37	.61	.57	.52	.65	.49
MERCURY ($\mu g/m^3$)							
1972 JAN-MAR	.32	.79	.53	.27	1.41		
APR-JUN	.49	1.44	1.07	.57	.29	2.03	.80
JULY-SEP	.46	1.73	.66	.50	.13	1.35	.70
OCT-DEC	.22	.35	.23	.28	.05	.43	.10

TABLE 90

ATMOSPHERIC METALS - 1973

WAYNE COUNTY, MICHIGAN

	STATION						
	01	04	05	06	012	32	34
CADMIUM ($\mu g/m^3$)							
1973 JAN-MAR	.0036	.0050	.0054	.0031	.0072	.0090	.0032
APR-JUNE	.0030	.0036	.0049	.0027	.0031	.0094	.0027
JULY-SEPT	.0036	.0040	.0054	.0027	.0027	.0112	.0027
OCT-DEC	.0042	.0048	.0069	.0028	.0031	.0093	.0056
BERYLLIUM (Nanograms/m^3)							
1973 JAN-MAR	.48	.54	.47	.27	.36	.69	.37
APR-JUNE	.46	.60	.54	.21	.20	.62	.36
JULY-SEPT	.28	.32	.52	.25	.20	.48	.20
OCT-DEC	.18	.34	.38	.26	.15	.51	.26
LEAD ($\mu g/m^3$)							
1973 JAN-MAR	.52	1.15	.57	.44	.29	.48	.16
APR-JUNE	.41	.35	.39	.30	.20	.36	.18
JULY-SEPT	.48	.73	1.03	.42	.24	.38	.18
OCT-DEC	.60	1.03	.98	.68	.42	.63	.33

6.4 Michigan State Department of Agriculture

Many industries in Michigan are disposing of the effluent from their waste water management systems by spray irrigating this effluent on fodder and other crops. As a result, the Michigan State Department of Agriculture has been working closely with local farmers to find out the effect of feeding these spray-irrigated crops to dairy cows. The Department has also been checking the milk from these cows for any problems.

Samples were submitted from selected farms from all parts of Michigan. Where the Department sampled crops, it also tried to sample the soil upon which the crops grew. Milk composite samples were used for milk control samples. Hay was tested from both treated and untreated fields. Crops and grasses were tested from many farms throughout the state.

The data resulting from the initial sampling program is shown in Table 91. The samples taken were insufficient to warrant any definite conclusions. There were many inconsistencies in the results and further investigation will be necessary to determine, for example, the transmission and fate of the heavy metals in the plants. The occurrence of higher levels of metals in the milk from cows eating untreated haylage than from those eating the treated type cannot be explained. This could reflect difficulties in sampling and analyses which further research should clarify.

TABLE 91
MICHIGAN STATE DEPARTMENT OF AGRICULTURE
HEAVY METALS PROGRAM

ND-NONE DETECTED

NUMBER OF SAMPLES	AVERAGE	METAL	CONCENTRATION in ppm		MATERIAL SAMPLED
	Hg	Pb	Cd	Cr	
15	.013	5.26	.118	1.844	SOIL
--	.025	2.7	.08	1.10	SOIL (FROM SPRAY IRRIGATED FIELDS)
--	ND	3.80	1.22	.95	HAYLAGE (FROM SPRAY IRRIGATED FIELDS)
--	ND	7.9	.24	3.80	SOIL (FROM NON-IRRIGATED FIELDS)
--	ND	1.2	.14	1.98	HAYLAGE (FROM NON-IRRIGATED FIELDS)
6 MONTHLY AVERAGES	.0003	.19	.048	.083	MILK (NON-SPRAY IRRIGATED)
8 MONTHLY AVERAGES	.0015	.27	.027	.086	MILK (SPRAY IRRIGATED)
6	ND	1.48	.031	.63	VEGETABLES (LAGOON)
3	ND	ND	ND	.096	VEGETABLES (SANDY LOAM)
4	ND	1.175	.072	.225	CORN (SPRAYED AREA)
1	ND	3.5	.08	1.20	SOIL (CORN) (SPRAYED AREA)
1	ND	5.0	.18	1.39	SOIL (CORN) (UNSPRAYED AREA)
3	ND	1.0	.106	.246	CORN (UNSPRAYED AREA)

6.5 International Reference Group on Upper Lakes Pollution-Study of Pollution Problems of Lake Huron and Lake Superior

This document discusses the study of Lake Superior, Lake Huron, and their connecting waters. The International Joint Commission (IJC) which was comprised of representatives from both the United States and Canada, prepared a specific set of questions to be studied by the Upper Lakes Reference Group (ULRG). This group, formed in the autumn of 1972, is a fourteen-member panel, with representatives from specific Federal, Provincial, and State agencies. The ULRG has the responsibility for studying the Reference Questions proposed by the IJC, and should report any findings by December 1975.

These reference questions discuss all facets of pollution problems in Lake Huron and Lake Superior. Seven of the eight toxic substances of interest are studied for their contaminating effects in fish tissue, water, soil and sediment, and air. These substances are PCB's, mercury, arsenic, cadmium, chromium and lead. The report does not present any data on the research which has been done so far.

7.0 CONNECTICUT AGENCY DATA ANALYSIS

7.1 Connecticut Department of Environmental Protection-Air Compliance Section

The concentrations of metals in the ambient air over Connecticut are measured at many sites throughout the state. The air compliance monitoring section in the Department of Environmental Protection owns most of the instrumentation, calibrates, and maintains the monitoring network. The chemical analysis of the specimens however, is performed by the Health Department.

High volume samplers are used to collect specimens. Samples are taken every sixth day; at the end of a calendar quarter a single chemical analysis is performed on the composite samples.

The Connecticut Department of Environmental Protection supplied data for 10 metals from 1969-1973. An example of this data is shown in Figure 52. The data for cadmium, lead, chromium, and beryllium for the years 1971-1973 was reduced using MITRE's statistical air data program. The data was transferred from the Connecticut Air Data Sheets to SAROAD Composite Data Forms for computer analysis. The results of this data are shown in Appendix A.

Suspended Particulate

Metals Analysis ug/m^3 cont.

2nd Quarter 1971

	Cd	Fe	Pb	Cr	Cu	Mn	Ni	Zn	Be	V
New Britain										
City Hall	0.0031	0.48	0.84	0.007	0.144	0.014	0.022	0.53	0.0000	0.25
Mid - A	0.0007	0.65	0.62	0.003	0.116	0.021	0.008	0.32	0.0000	0.13
Pulaski H.S.	0.0016	0.21	0.31	0.003	0.149	0.009	0.005	0.44	0.0000	0.13
Smith Sch.	0.0015	0.25	0.31	0.003	0.107	0.010	0.013	0.50	0.0000	0.18
New Haven										
Airport										
Beecher Sch.										
Bullard Bldg.										
Clinton Sch.										
Truman Sch.	0.0022	0.55	0.87	0.004	0.163	0.018	0.020	0.50	0.0000	0.18
Norwalk										
A.S.C. Bldg.	0.0020	0.26	0.38	0.004	0.071	0.009	0.006	0.55	0.0000	0.06
Health Dept.	0.0021	0.35	0.59	0.004	0.072	0.016	0.006	0.69	0.0000	0.06
Norwich										
Sav. & Loan	0.0008	0.30	0.41	0.007	0.174	0.008	0.010	0.29	0.0000	0.15
Orange										
Air Nat'l. Guard	0.0014	0.39	0.29	0.003	0.228	0.015	0.007	0.37	0.0000	0.04
Putnam										
Superior Court	0.0029	0.38	0.61	0.005	0.065	0.017	0.025	0.57	0.0000	0.23
Stamford										
Dolon Sch.	0.0030	0.38	0.86	0.003	1.114	0.015	0.014	0.23	0.0000	0.13
Main Fire House	0.0018	0.34	0.76	trace	0.407	0.011	0.009	0.20	0.0000	0.06
Stratford										
Bunnell H.S.	0.0025	0.21	0.30	0.009	1.374	0.010	0.014	0.44	0.0000	0.13
Stratford H.S.	0.0016	0.27	0.58	0.009	0.078	0.012	0.031	0.55	0.0000	0.35

FIGURE 52
SAMPLE OF CONNECTICUT AIR DATA

FOURTH QUARTER

DATA SUMMARY AND ANALYSIS

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RESULTS OF DATA ANALYSIS

1.0 CONNECTICUT AGENCY DATA ANALYSIS

1.1 Connecticut State Department of Health, Environmental Health Services

This agency provided the results of a study of heavy metal content in shellfish, January 1970-June 1974. Species of shellfish used were the oyster in New Haven Harbor, Housatonic River and Bridgeport Harbor. The oyster and clam were used in Norwalk Harbor due to availability of the clam resource. The data in Table 92 was obtained by sampling shellfish in closed areas.* There was no open (approved) area sampling for heavy metals done from 1970-73.

The New Haven Harbor appeared to be satisfactory with results showing that all heavy metals were within Interim FDA guidelines.** The Housatonic River had some relatively high lead values but remained within FDA guidelines. In Bridgeport Harbor, the cadmium levels in oysters exceeded FDA guidelines. The chromium level approached and exceeded the FDA limit on different occasions. Norwalk Harbor oysters did not approach or exceed FDA guidelines. Clam samples, however, did exceed the cadmium guideline with chromium content approaching the guideline level. It would appear from the data that the high cadmium content in the clams was due to waste discharges containing cadmium entering the waterways. The remaining cadmium values for samples taken in 1972-1974 were below the guideline level.

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*Areas not approved for market harvesting.

**Defined to be an attempt to correlate the chemical water quality of shellfish growing waters with average background levels found in North-East part of the country. Not intended to relate to public health significance of a particular metal found in the shellfish themselves.

TABLE 92

CONNECTICUT DEPARTMENT OF HEALTH
ENVIRONMENTAL HEALTH SERVICES

(mg/kg of Shellfish Meat)

HEAVY METAL CONTENT IN SHELLFISH JANUARY 1970 - JUNE 1974

NAME OF HARBOR	SHELLFISH	NO. OF SAMPLES	METAL	RANGE	MEAN
New Haven	Oyster	36	Hg	0.01 - 0.10	0.04
		36	Pb	0.08 - 6.00	0.78
		36	Cr	0.00 - 6.00	0.94
		31	Cd	0.16 - 9.6	2.3
Housatonic River	Oyster	10	Hg	0.00 - 0.13	0.047
		9	Pb	0.40 - 2.00	1.26
		9	Cr	0.00 - 1.70	0.99
		8	Cd	0.00 - 6.00	2.68
Bridgeport Harbor	Oyster	22	Hg	0.00 - 0.18	0.04
		19	Pb	0.12 - 10.80	0.84
		22	Cr	0.00 - 8.50	1.60
		22	Cd	0.00 - 43.00	7.91
Norwalk	Oyster	13	Hg	0.00 - 0.03	0.02
		12	Pb	0.11 - 1.40	0.58
		13	Cr	0.00 - 2.90	0.60
		13	Cd	0.10 - 7.3	2.4
	Clam	4	Hg	0.01 - 0.08	0.04
		4	Pb	0.18 - 1.20	0.67
		5	Cr	0.00 - 2.00	0.80
		4	Cd	0.00 - 1.6	0.54

1.2 University of Connecticut - Annual Report of the Department of Pathobiology 1972-73

The annual report was received from the above-mentioned university department. This report discusses all of the activities of the Department of Pathobiology, of which two particular animal studies are of interest.

The first study dealt with fetal and neuropathology of methylmercury toxicosis in the dog, pig, and cat. Methylmercury is one of the most widespread and toxic mercury compounds, and it is presently one of the most important pollutants in our environment. It affects several species of wildlife in addition to domestic animals and man. Preliminary experimental studies have been encouraging in that the estimated experimental toxic dose caused reproducible, well defined neurological changes within three weeks. They revealed histologic changes in the brain of cats and pigs and in the medium sized arteries of the procine meninges. The dog appeared relatively resistant to mercury in comparison with the two other species.

The second study dealt with lead toxicosis in rabbits, in which an experimental study was carried out with forty-eight rabbits that were fed various levels of lead acetate, in order to study the effect of plumbism on the nervous system and red cell formation. A comparison was made of three different assay systems --the erythrocyte flourescence test, the ALA* levels in the urine, and the erythrocyte morphology. The study was conducted in cooperation with the Department of Nutritional Sciences.

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*Aminolevulinic Acid

1.3 University of Connecticut - Master's Thesis: "Presence and Influence of Certain Heavy Metals on the Yield and Utilization of Medicago Sativa L."*

The thesis is based on data obtained by experimentation and, as such, this data will not be presented in this report but will be kept at EPA in the data files.

The paper deals mainly with the ability of animals (meadow voles) and forage crops (alfalfa) to accumulate heavy metals; in particular lead, cadmium, and nickel.

In Connecticut, the primary agricultural industry is dairy farming, with forage crops playing a major role. The first phase of this thesis determined the ambient levels of lead, cadmium, and nickel in Connecticut alfalfa. This phase was initiated primarily because of automotive emissions, a major source of heavy metal pollution.

This phase was followed by greenhouse experimentation to determine how lead, nickel, and cadmium influenced alfalfa growth.

The final phase involved a study of animal consumption of contaminated forage, using the meadow vole as the test animal. Voles that were fed the contaminated diets were necropsied and their tissue analyzed for heavy metal content.

The conclusions derived from the Connecticut alfalfa survey are as follows:

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*Richard Wayne Taylor, Master's Thesis, University of Connecticut, 1974.

- The concentrations of Pb, Ni, Cd found in alfalfa in 1972 and 1973 surveys were within normal ranges for plant tissue, 2.8 - 33.2 ppm, 0.5 - 9.4 ppm, 0.00 - 0.96 ppm respectively.

- Grouping the sampling sites into rural, suburban, and industrial highway categories showed consistently greater alfalfa lead values in the industrial/highway categories. In 1973 significant differences were evident between sites for Pb, Ni, Cd alfalfa concentrations.

- Washing of samples did not affect detected levels of Pb, Ni, Cd.

- The correlations between percent IVDMD* and concentrations of either Pb, Cd, or Ni in alfalfa were not significant.

The basic conclusions derived from the greenhouse experiments are as follows:

- Pb applied to soil did not consistently affect alfalfa yield.

- Increasing soil Pb concentrations resulted in increased alfalfa Pb concentrarions.

- Uptake of Pb in the first harvest was greatest when Pb nitrate was used as compared to Pb sulfate. In both experiments Pb concentrations were greater in the first harvest than in the second harvest.

- Cd, applied to the soil, consistently depressed alfalfa yields, particularly at the 250 ppm rate and in the first harvest.

- Alfalfa effectively absorbed cadmium from the soil. Levels of cadmium in alfalfa were greatest in the first harvest compared to the second.

- The 250 ppm rate of applied cadmium caused some plant mortality as well as growth reduction.

- Applied nickel depressed alfalfa growth.

- The 250 ppm applied nickel caused considerable plant mortality and stunted growth.

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*_In Vitro_ dry matter digestabilities.

- Nickel concentrations in alfalfa were greatest in the first harvest compared to the second harvest and concentrations appeared as a function of soil concentration.

- Nickel concentrations in alfalfa were greater in soils treated with sulfate compared to nitrate salt of nickel.

- None of the metals at the rates and methods of application used, appeared to move through the soil mass in anything other than trace quantities.

The conclusions derived from the meadow vole studies are as follows:

- Diets containing "organic" copper or Pb at a rate of 200 ppm did not affect weanling growth.

- Diets containing inorganic lead (5200 ppm) plus organic copper (125 ppm) resulted in significantly higher weight gains compared to diets containing the lead alone.

- Diets of organic lead (5200 ppm) resulted in growth depression even though copper was present. Lead was excreted in the feces and accumulated in skeletal tissues.

- Voles fed diets containing 5200 ppm organic lead tended to accumulate less lead in the skeletal tissues than voles given diets containing 5200 ppm inorganic lead, regardless of the presence of copper.

- Weanling voles fed diets containing 450 or 550 ppm cadmium showed significant growth reduction, regardless of the type of cadmium, organic or inorganic. Cadmium was excreted in the feces and accumulated primarily in the liver and kidney.

- Diets containing organic nickel at concentrations of 270 ppm resulted in reduced weanling vole growth compared to control diets. Nickel was excreted in the feces and appeared to accumulate in the skeletal tissue.

1.4 The Connecticut Agricultural Experiment Station, New Haven, Connecticut

The following are abstracts of published research done at the Connecticut Agricultural Experiment Station. Copies of the reprints are at EPA.

1. Lead Content of Printed Polyethylene Food Bags, by Lester Hankin, G. H. Heichel, and Richard A. Botsford

Plastic sheets and film used in making polyethylene bags for bread, rolls, candy, snacks and cereal are often printed by flexography, a variation of the letterpress process widely used in printing magazines. It has previously been shown that letterpress inks used in magazines, especially the colored pages, contain up to 29,000 ppm of lead. Knowledge of this prompted the authors to examine polyethylene bags.

It was found that even though the ink markings on the exterior of the bags contained large amounts of lead, the interior of the bags contained less than the limit of detectibility.

2. Lead Content on Wrappers of Specialty Foods as a Potential Hazard for Children, by Lester Hankin, G. H. Heichel, and Richard A. Botsford

Knowledge of lead content of letterpress inks led to the examination of lead content of printed paper wrappers used to package bakery confections, lollypops, chewing gum, candy, confection-filled straws, and frozen confections such as ice cream bars.

The authors noted the danger is not one of migration of lead from printed side to the food, but one of handling the wrappers and placing them into the mouth, as with the straws, or licking or chewing the wrapper to remove adhering edible material.

3. Lead Poisoning from Colored Printing Inks, by Lester Hankin, Gary H. Heichel, and Richard A. Botsford

The author set out to discover the cause of the abnormally high blood lead level in a nine-year-old child with pica after he had ruled out lead based paint chips as the source.

It was discovered that of the many things the child had in this diet of non-food items, that magazines, especially the colored pages, contained from 8 - 3,600 ppm lead. It was also discovered that the cause of this was the color pigments of the ink and not the paper, even though recycled paper contains up to 12 times the amount of lead of virgin paper. Among the inks, yellow contained 29,000 ppm, red 4,100 ppm, blue 445 ppm, and black 275 ppm lead.

4. Newspapers and Magazines as Potential Sources of Dietary Lead for Dogs, by Lester Hankin, Gary H. Heichel, and Richard A. Botsford

It has been shown that magazine and newspaper inks often contain high levels of lead which may be potentially dangerous to small children. This article looks at the same problem in dogs who may ingest shredded newspapers and magazines used as litter--pups are especially prone to this type of behavior.

5. Lead in Paper: A Potential Source of Food Contamination, by G. H. Heichel, Lester Hankin, and Richard A. Botsford

The article explores possible contamination of food from wrappers made of recycled paper printed with lead-based inks, the feeding of waste paper to beef and dairy cattle and its effect on meat and milk products, and the use of waste paper as a mulch in gardens and its effect on lead content of the plants.

The authors conclude that the packaging of food in printed paper may be a cause of lead contamination, but it is unlikely since most foods are separated from the printing by an intervening barrier. Similarly, it was found that the feeding of waste paper to beef and dairy cattle has little additional effect on the lead content of meat and milk products. They also found no effect on the plants using waste paper as mulch in vegetable gardens.

6. Lead Emission from Incinerated Sewage Sludge Detected on Tree Foliage, by George R. Stephens, Lester Hankin, and William D. Glover, Jr.

The article discusses the contamination of trees with lead emitted with the incineration of sewage sludge. The study was conducted with samples taken from trees near two sewage treatment facilities, a highway, and a rural setting. The results of the tests (Table 93) show the greatest amounts of lead on the trees near the two treatment plants and the least amount from the rural setting. Other heavy metals were tested, but only traces were found.

TABLE 93

RESULTS OF SEWAGE SLUDGE STUDY

Source	No. Samples	Lead Content (ppm)*
Facility No. 1	16	49 ± 5.4
Highway N of Facility No. 1	5	29 ± 2.3
Facility No. 2	7	15 ± 1.6
Rural	1	6

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*Mean and Standard Error

7. Particles Containing Lead, Chlorine, and Bromine Detected and Trees With An Electron Microprobe, by Gary H. Heichel, and Lester Hankin

The article explores the association of lead with chlorine and bromine on particles of about 7μm in diameter which are embedded or are on the bark of trees. Similarities between these lead bearing particles found on trees and some of the compounds found in automobiles exhaust are discussed.

8. Lead in Pet Food and Processed Organ Meats, by Lester Hankin, Gary H. Heichel, and Richard A. Botsford

The authors have raised concerns over the lead content of pet foods because it has been shown that this may also be a human problem. It has been alleged that some of these products are used for human consumption. The lead content of certain sandwich spreads and liverwurst is explored in order to determine whether a health problem exists.

9. Modification and Use of the Dipstick Test, Based on Urinary Delta-Aminolevulinic Acid (ALA), for the Detection of Lead Poisoning in Children, by Joseph M. Kornfeld, William W. Ullman, and Lester Hankin

Modification of the dipstick test used to detect delta-amenolevulinic acid in urine, and thus find potential victims of lead poisoning, has been made. A method has been developed to remove interfering materials found in some urines. Use of this dipstick test in Connecticut is discussed.

10. School of Forestry and Environmental Studies, Yale University, New Haven, Connecticut, by William H. Smith

Metal Contamination of Urban Woody Plants

During the fall of 1970, leaf and twig tissue from six woody plant species was collected throughout the city of New Haven. Sugar maple samples were obtained from New Hampshire and Vermont to represent woody tissue from a non-urban environment. The samples were tested for 13 metals by atomic absorption spectrophotometry. Of these, only Pb, Cr, Cd, Ni, Cu, and Zn were of interest in this report. Table 94 has been extracted from the tables in the report. Cd and Cu were present in "normal" amounts; Cr and Ni in "slightly above normal" amounts; Pb and Zn were present in "above normal" amounts.

The article discusses the various factors taken into consideration during the experiments and explains the effects of these substances upon the plant life subjected to them.

TABLE 94
METAL CONTAMINATION OF URBAN WOODY PLANTS

Species	Tissue Analyzed		Cd*		Cu		Cr		Ni		Pb		Zn	
	Organ	No. of sum	Range	Mean	Range	Mean	Range	Mean	Range	Mean	Range	Mean	Range	Mean
Pin Oak (Quercus Palustris Muenchh.)	Leaves	12	1.5-3.	2.3	9-15	11	2.3-12.5	3.8	6-13	10	55-220	121	65-209	137
	Twigs	12	1.-3.	2.3	6-11	9	1.2-5.7	2.8	5-16	8	25-125	67	19-68	49
Sugar Maple (Acer Saccharm Marsh.)	Leaves	7	.5-1.5	1.0	6-8	6	1.2-3.4	1.9	9-28	14	35-120	64	47-158	111
	Twigs	7	.5-1.5	0.8	7-14	10	1.8-3.4	2.3	8-17	11	38-195	113	36-134	72
Norway Maple (Acer Platanoides L.)	Leaves	32	.5-2.0	1.1	0.5-31	9	1.2-6.2	2.8	.05-15	6	45-485	146	28-429	142
	Twigs	32	.5-2.0	0.7	7-22	10	1.1-2.3	1.6	.05-6	2	10-300	101	21-134	66
Eastern Hemlock (Tsuga Canadensis [L.] Carr.)	Leaves	8	0.5-1.0	.9	6-11	8	1.2-4.6	2.8	5-13	8	25-180	91	30-98	54
	Twigs	8	0.5-1.8	1.2	13-19	16	1.2-4.6	3.5	6-22	11	155-760	315	70-177	117
Yew (Taxus spp.)	Leaves	10	0.5-2.5	1.2	7-12	9	2.3 5.7	3.9	5-19	10	40-240	139	109-650	351
	Twigs	10	0.5-4.1	2.0	8-21	12	2.3-16.3	6.0	4-13	9	70-371	177	116-510	293
Norway Spruce (Picea Abies [L.] Karst.)	Leaves	4	0.5-1.0	0.7	5-8	6	2.3-3.4	2.6	5-8	7	45-100	375	80-122	102
	Twigs	4	0.5-1.0	0.8	13-16	15	4.6-5.7	4.9	5-9	7	100-240	163	94-157	119

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*All numbers are on a dry wt. basis, µg/g

1.5 Connecticut Water Compliance and Hazardous Substances, Division of Environmental Quality

Copies of data obtained during an intensive survey of the lower Housatonic River during 1973 were received. Of all the parameters studied during this survey, only one was of interest to OTS, chromium. Most of the other parameters were biological. Of the 32 chromium samples received, there was a mean value of 27.19 mg/l with a standard deviation of 37.61 mg/l. The range of values was from 0.0 to 1.40 mg/l.

Copies of discharge forms were also received as submitted to the Water Compliance Division by three companies. The only toxic substances shown on the discharge forms were cadmium and hexavalent chromium. These values were either left blank or below detectable limits.

1.6 University of Connecticut, Marine Sciences Institute

The University of Connecticut provided a report entitled "Investigations on Concentrations, Distributions, and Fates of Heavy Metal Wastes in Parts of Long Island Sound" which was submitted by them to the Office of Sea Grant Programs, National Oceanic and Atmospheric Administration.

This report deals with a two-year investigation on heavy metal wastes in Long Island Sound with emphasis on the Eastern Sound and the Connecticut coast. The program consisted of five integrated projects with the ultimate objective being to determine a preliminary distribution of these wastes. The projects were concerned with concentrations, distributions, and fates of heavy metals in the water column, water circulation patterns and water renewal times in the Sound, the transport of suspended materials in the Sound, and the uptake of metals in oysters at various locations along the Connecticut coast.

2.0 NORTH CAROLINA AGENCY DATA ANALYSIS

2.1 North Carolina Department of Human Resources - Division of Health Services

A copy of a printout for chemical analyses of water for public water supplies in North Carolina for the years 1971 and 1972 was received. There were approximately 1,890 samples, each of which were analyzed for a wide variety of parameters, including color, alkalinity, hardness, pH, turbidity, etc. Of the 12 trace elements analyzed for, arsenic, cadmium, hexavalent chromium (Cr^{+6}), and lead were the parameters of interest to this study.

Different types of water data were coded categorically on the printout data sheets. As can be seen in Figure 53, four major headings were used to characterize the nature of the sample;

- A - Type of Supplier
- B - Source of Water
- C - Source of Sample
- D - Type of Sample

It is interesting to note the consistency of trace metal levels throughout the entire group of data, considering the fact that the data values were representative of a wide variety of sample types. Table 95 shows the ten instances where a deviation from the recurring data readings occurred. In five of the cases, a higher reading was observed in arsenic for raw (untreated) tap water. In three cases, lower than normal readings were observed for Cr^{+6} and Pb in untreated water, and two cases showed lower than normal readings in treated water.

A. TYPE OF SUPPLIER
[illegible]
[illegible] PARK DIST
[illegible] MOBILE HOME PARK
[illegible]
[illegible]
6 INDUSTRIAL
7 INSTITUTION
8 PRIVATE
9 OTHER

B. SOURCE OF WATER
1 GROUND
2 SURFACE
3 BOTH
4 PURCHASED

C. SOURCE OF SAMPLE
1 WELL TAP
2 HOUSE TAP
3 DISTRIBUTION TAP

D. TYPE OF SAMPLE
1 RAW
2 TREATED

LAB NO	COUNTY CODE	NAME OF OWNER OR SUPPLY	WELL NO	A	B	C	D	DATE COLLECTED		COLOR	pH	ALKALINITY CaCO3	TOTAL HARDNESS	IRON	MANGANESE	TURBIDITY SiO2	ACIDITY CaCO3	CHLORIDE	SODIUM	POTASSIUM	FLUORIDE	ARSENIC	CADMIUM	CHROMIUM-6	COPPER	LEAD	ZINC
								MO	YR																		
[illegible]	26	DEVONWOOD SUBDIVIS	01					5	72	005	083	093	041	00.20	*00.03	001	000	003	029	03.4	0.17	*0.01	*0.01	*0.05	*00.05	*0.05	*00.[illegible]
[illegible]	50	DILLSBORO	02	1	1	1	1	10	71	000	072	030	039	*00.05	*00.03	005	006	004	006	02.5	0.15	*0.01	*0.01	*0.05	*00.05	*0.05	00.[illegible]
[illegible]	26	DILTONS PARK INC	01	3	1	2	1	05	72	000	079	094	084	*00.05	00.10	003	005	017	047	05.1	0.19	*0.01	*0.01	*0.05	*00.05	*0.05	00.07
9730	60	DIXIE TRAILER PARK		3	1	2	1	05	72	000	079	228	219	00.14	*00.03	001	028	029	020	00.6	0.19	*0.01	*0.01	*0.05	*00.05	*0.05	00.05
[illegible]	36	DIXON MOBILE HOMES		3	1	2	1	05	72	000	074	035	037	00.10	*00.03	063	009	003	004	00.9	0.10	*0.01	*0.01	*0.05	*00.05	*0.05	00.74
[illegible]	31	DIXON MOBILE HOME		3	1	1	1	05	72	000	063	008	079	*00.05	00.03	030	014	007	004	02.5	0.10	*0.01	*0.01	*0.05	*00.05	*0.05	*00.[illegible]
[illegible]	86	DOBSON		1	2	3	2	09	71	000	073	017	036	*00.05	*00.03	003	002	004	002	01.0	0.11	*0.01	*0.01	*0.05	*00.05	*0.05	*00.[illegible]
[illegible]	61	DOGWOOD TRAILER CO		3		2	1	06	72	005	077	144	142	00.20	00.11	002	009	006	010	01.7	0.14	*0.01	*0.01	*0.05	00.07	*0.05	00.[illegible]
[illegible]	61	DOGWOOD TRAIL HOME						2	72	000	066	056	045	*00.05	*00.03	004	030	005	009	00.8	0.10	*0.01	*0.01	*0.05	*00.05	*0.05	00.[illegible]
[illegible]	50	DOGWOOD TRAILER PA		3	1	1	1	06	72	000	073	035	037	*00.05	*00.03	003	007	002	007	01.4	0.12	*0.01	*0.01	*0.05	*00.05	*0.05	*00.[illegible]
[illegible]	[illegible]	DOGWOOD MOBILE HOM	01	3	1	1	1	[illegible]	72	000	079	172	174	*00.05	*00.03	085	012	056	038	05.7	0.23	*0.01	*0.01	*0.05	*00.[illegible]	*0.05	01.[illegible]
[illegible]	20	DOGWOOD MOBILE HOM	01	3	1	1	1	08	72	000	073	033	028	*00.05	*00.03	063	024	001	006	01.1	0.19	*0.01	*0.01	*0.05	*00.[illegible]	*0.05	00.[illegible]
[illegible]	76	DOGWOOD HILL MOBIL		3	1	1	2	05	72	000	075	030	010	*00.05	*00.03	004	016	002	006	00.7	0.09	*0.01	*0.01	*0.05	*00.05	*0.05	00.71
[illegible]	51	DOGWOOD MOBILE TRA						6	72	000	071	039	031	*00.05	*00.03	001	019	001	006	00.7	0.12	*0.01	*0.01	*0.05	*00.05	*0.05	00.4[illegible]
[illegible]	32	DOGWOOD [illegible] MOBI	01	3	1	1	1	05	72	000	072	037	025	*00.05	*00.03	006	019	002	008	00.6	0.12	*0.01	*0.01	*0.05	*00.05	*0.05	01.72
[illegible]	47	DOGWOOD ACRES MOBI	01	3	1	1	1	06	72	000	072	041	032	*00.05	*00.03	007	016	002	006	01.1	0.10	*0.01	*0.01	*0.05	*00.05	*0.05	00.11
[illegible]	56	DONALDS TRAILER CO		3	1	1	1	05	72	000	064	006	008	*00.05	*00.03	004	015	003	002	00.7	0.08	*0.01	*0.01	*0.05	*00.05	*0.05	*00.[illegible]
[illegible]	36	DONNA LYNN MOBILE	04	3	1	1	1	07	72	000	074	054	059	*00.05	*00.03	065	008	002	008	01.8	0.84	*0.01	*0.01	*0.05	*00.05	*0.05	00.4[illegible]
[illegible]	36	DOTSON TRAILER PAR	01	3	1	1	1	09	72	000	073	098	093	00.15	*00.03	025	021	004	009	01.0	0.10	*0.01	*0.01	*0.05	*00.05	*0.05	*00.05
[illegible]	65	DOUBLE D MOBILE HO						6	72	000	079	164	176	00.75	*00.03	005	015	008	005	01.2	0.10	*0.01	*0.01	*0.05	*00.05	*0.05	00.25
[illegible]	43	DOUGLAS MOBILE HOM								000	057	004	014	*00.05	00.03	003	013	006	7	00.7	0.08	*0.01	*0.01	*0.05	01.52	*0.05	00.[illegible]
[illegible]	25	DOVER	02	1	1	1	1	09	71	007	082	176	014	00.06	*00.03	009		002	080	09.1	0.32	*0.01	*0.01	*0.05	*00.05	*0.05	*00.05
[illegible]	24	DOVER PARK MOBL HM	01	[illegible]	1	1	2	03	72	003	073	040	076	00.09	00.13	025	016	013	011	02.5	0.18	*0.01	*0.01	*0.05	*00.05	*0.05	0[illegible]
[illegible]	[illegible]	[illegible] MOBILE [illegible]		[illegible]	1	1	1	09	72	000	069	010	020	*00.05	*00.03	009	026	007	013	01.6	0.10	*0.01	*0.01	*0.05	*00.05	*0.05	00.2[illegible]
[illegible]	17	DREAMLAND MOBILE H		3	1	1	1	06	72	007	074	114	112	01.05	00.08	080	007	003	004	01.1	0.12	*0.01	*0.01	*0.05	*00.05	*0.05	00.1[illegible]
[illegible]	12	DREXEL		1	2	3	2	07	71	000	079	039	016	00.07	*00.03	002	002	005	021	01.1	1.05	*0.01	*0.01	*0.05	*00.05	*0.05	*00.05
[illegible]	65	DRIFTWOOD VILLAGE		3	1	2	1	04	72	000	073	076	092	*00.05	*00.03	007	018	012	012	00.9	0.09	*0.01	*0.01	*0.05	*00.05	*0.05	00.[illegible]

*Detectable Limit.

FIGURE 53
CHEMICAL ANALYSIS OF WATER

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TABLE 95

SUMMARY OF SIGNIFICANT DEVIATIONS FROM NORMAL TRACE METAL VALUES IN NORTH CAROLINA CHEMICAL WATER ANALYSES FOR As, Cd, Cr^{+6}, AND Pb

DATE MONTH YEAR	SOURCE OF H_2O	TYPE OF SAMPLE	DEVIANT DATA VALUE*			
			As	Cd	Cr^{+6}	Pb
04/72	Ground	Raw			<.03	
09/71	Ground	Raw				<.01
06/72	Ground	Raw	<.02			
07/72	Ground	Raw	<.05			
07/72	Ground	Raw	<.04			
06/72	Ground	Raw	<.03			
06/72	Ground	Raw	<.07			
08/72	Ground	Raw				.45
02/72	Surface	Treated				<.01
02/72	Surface	Treated			<.03	

---

*Recurring Values:		
	As	<0.01
	Cd	<0.01
	Cr^{+6}	<0.05
	Pb	<0.05

It is fair to assume a high level of consistency of trace metal levels in North Carolina water supplies since only these ten isolated deviations were detected out of 1,890 total samples.

3.0 FLORIDA AGENCY DATA ANALYSIS

3.1 Florida/Metropolitan Dade County Pollution Control

The Dade County Pollution Control Office provided a variety of data on air, dust and water.

Some lead data was received from the Hi-Vol sampling system for 1970-1974, but since it is already in the SAROAD system, it will not be analyzed.

A report entitled "The Miami River" was also received. This report deals primarily with environmental clean up measures that were undertaken to restore the aesthetic and biological quality to the Miami River. The only piece of data on toxic substances in this report was the fact that recent research in several cities of the United States and in Europe found that state road type, two lane highways, accumulate 350 lbs/mile of dust and dirt a day, which contains the following heavy metals and PCB (average values) values:

• Lead	0.65 lb.
• Mercury	0.07 lb.
• Chromium	0.11 lb.
• PCB	1100×10^{-6}

In addition to the high volume sampling lead data that is in the SAROAD data bank, Hi-Volume lead sampling data was received for the special lead study program dealing with Sahara dust in Florida. According to sources in Florida, dust becomes air-borne in the African Sahara Desert, reaches tremendous altitudes, and undergoes transoceanic transport. The purpose of this study is to provide the statistics of the number of particulates, organics, and metals that settle in Florida as a result of this transport process. Of the metals for which analyses are done, lead is the only one of current interest to OTS.

Tables 96 and 97 illustrate the lead data obtained using selected sampling sites based on August 7th, 1974 background data, and a comparison of background data with the data obtained through the September 1973 to February 1974 data.

Tables 98 and 99 display lead data sampled at random sites for the same time period and its comparison with background data obtained at Site No. 27.

Water quality data was also received from Dade County. Samples were taken from 20 sites comparing canals without STP effluents in residential areas with canals in agricultural areas without STP effluents for biological and chemical parameters. This included Pb, Cr, and Cd in the trace metal section. The values given for each site were averages of six samples taken at each site in either the fourth quarter of 1974 or the first quarter of 1975. All values for Pb, Cd, and Cr were zero in this survey, except for one case where the Black Creek Canal, in an agricultural area, and the Ludlam Canal in a residential section, showed an average reading of 0.3 ppm in January of 1975.

TABLE 96
SAHARA DUST STUDY IN DADE COUNTY–STATISTICS OF SAHARA DUST STUDY IN DADE COUNTY USING SELECTED SAMPLING SITES BASED ON 24-HOUR AUGUST 7th, 1974 HI-VOL RESULTS SEPTEMBER 1973 THRU FEBRUARY 1974

Pb $\mu g/m^3$

SITE NO.	8	10	12	14	16	19	20	21	23	25	28	6 MOS DATA
NO. OF OBSER.	21	19	20	24	24	22	22	20	17	23	23	235
AVER.	2.1	1.3	1.5	1.1	1.4	1.5	0.8	0.9	0.5	1.3	2.8	1.4
STD. DEV.	1.1	1.0	0.8	0.8	1.2	0.9	0.7	1.0	0.4	0.9	1.7	1.2
MAX	5.5	3.8	3.9	3.0	3.7	3.7	2.1	3.5	1.4	4.0	6.8	6.8
MIN	0.6	0.4	0.6	0.3	0.2	0.4	0.3	0.1	0.1	0.1	0.5	0.1

TABLE 97

SAHARA DUST STUDY IN DADE COUNTY-
SUMMARY OF AMBIENT AIR POLLUTANT CONCENTRATIONS FOR
TEST PERIODS OF SEPTEMBER 1973 THRU FEBRUARY 1974 AND AUGUST 7, 1974

Pb μg/m^3

	SEPTEMBER 1973 THRU FEBRUARY 1974					AUGUST 7th, 1974*				
	NO. OF OBS.	ARITH MEAN	STD. DEV.	MAX. RDG.	MIN. RDG.	NO. OF OBS.	ARITH MEAN	STD. DEV.	MAX. RDG.	MIN. RDG.
LEAD	235	1.4	1.2	6.8	0.1	11	1.1	0.8	2.8	0.2

---

* Day with High-Volume Filter Discoloration

NOTE: High-Volume results during both sampling periods were taken from the same 11 sampling sites.

Sampling Site No's: 8, 10, 12, 14, 16, 19, 20, 21, 23, 25, and 28.

TABLE 98
STATISTICS OF SAHARA DUST IN DADE COUNTY USING HI-VOL SAMPLING
SEPTEMBER 1973 THRU FEBRUARY 1974

Pb $\mu g/m^3$

SITE NO.	1	8	10	12	13	14	15	16	19	20	21	22	23	24	25	28	6 MOS DATA
NO. OF OBSERV.	18	21	19	20	17	24	21	24	22	22	20	15	17	23	23	23	339
AVER.	1.4	2.1	1.3	1.5	1.5	1.1	0.9	1.4	1.5	0.8	0.9	1.5	0.5	0.9	1.3	2.8	1.3
STD. DEV.	0.8	1.1	1.0	0.8	0.8	0.8	0.7	1.2	0.9	0.7	1.0	1.5	0.4	0.6	0.9	1.7	1.1
MAX.	3.7	5.5	3.8	3.9	2.9	3.0	3.3	3.7	3.7	2.1	3.5	3.0	1.4	2.4	4.0	6.8	6.8
MIN.	0.6	0.6	0.4	0.6	0.0	0.3	0.2	0.2	0.4	0.3	0.1	0.3	0.1	0.2	0.1	0.5	0.0

TABLE 99

SAHARA DUST STUDY IN DADE COUNTY
COMPARISON OF AMBIENT AIR POLLUTANT CONCENTRATION AT
16 SAMPLING SITES AND BACKGROUND SITE DURING
TEST PERIOD FROM SEPTEMBER 1973-FEBRUARY 1974 BY 24-HOUR
HIGH-VOLUME SAMPLER

Pb μg/m^3

	SEPTEMBER 1973 THRU FEBRUARY 1974 16 SAMPLING SITES (SITE #11 OMITTED)					SEPTEMBER 1973 THRU DECEMBER 1973 BACKGROUND SITE (NO. 27)				
	NO. OF OBS.	ARITH MEAN	STD. DEV.	MAX. RDG.	MIN. RDG.	NO. OF OBS.	ARITH MEAN	STD. DEV.	MAX. RDG.	MIN. RDG.
LEAD	339	1.3	1.1	6.8	0.0	13	0.1	[illegible]	1.0	0.0

NOTE: Sampling results from background site (No. 27) not used in computing statistics for 16 sampling sites ARITH. MEAN, STD. DEV., ETC.

Sampling Site No. 11 data omitted due to insufficient amount of data collected.

3.2 Florida Department of Health and Rehabilitative Services, Division of Health

The Florida Division of Health provided some water analysis data forms for January and February of 1975. The samples were taken from raw and treated water sources in Duval, Pasco, Escambia, and Collier counties. Among the toxic substances examined on the data forms were As, Cd, Pb, Cr, and CN. For all samples, the values were low, being either zero or just above detectable limit.

4.0 TENNESSEE AGENCY DATA ANALYSIS

4.1 Tennessee Department of Public Health, Division of Air Pollution Control

The state of Tennessee monitors trace metals in the atmosphere by analyzing the filters received from the Hi-Vol sampling units which are dispersed throughout the state sampling network. The division of air pollution control employs fifty-one fixed sites in thirty-seven cities, eight continuous monitoring sites and five special studies sites. Sampling is conducted randomly on a twenty-four hour or "daily" sampling period.

Heavy metal data was received from fifteen fixed sampling sites for many parameters including arsenic, beryllium, cadmium, chromium and lead covering the period of years 1972 through 1974.

This daily trace metal data was transferred to SAROAD daily data forms, keypunched, and analyzed statistically by computer program to produce data by site and constituent for the following parameters:

- Number of Samples
- Minimum
- Maximum
- Average
- Standard Deviation

A sample of the Tennessee data appears as Figure 54. The results of the data analysis are displayed in Appendix A of Volume IV of the Final Report, Compilation of the Summaries and Analyses of State Data.

UNITS: $\mu g/m^3$

DATE: 7-1-72 to 6-30-73

METHOD: HI-VOL & ATOMIC ABSORPTION

STATION	COPPERHILL			NUMBER	14-1
DATE	2-10	3-16	4-23	5-29	6-10
ALUMINUM	----	----	----	2.55	1.38
ARSENIC	.262*	.262*	----	----	----
BERYLLIUM	.004*	.004*	.002*	.002*	.002*
CADMIUM	.033*	.033*	.016*	.016*	.016*
CHROMIUM	.013	.013*	.006*	.006*	.006*
COBALT	.020*	.020*	.010*	.010*	.010*
COPPER	.300	.503	.091	.119	.377
IRON	22.26	16.9	3.59	4.48	12.7
LEAD	.349	.679	.185	.255	.637
MAGNESIUM	1.50	.390	.789	.721	.416
NICKEL	.013*	.013*	.006*	.006*	.006*
SELENIUM	.262*	.262*	.131*	----	----
TIN	.394*	.394*	.197	.197*	.197*
TITANIUM	.262*	.262*	.131*	.131*	.131*
VANADIUM	----	----	----	.098*	.098*
MANAGANESE	.270	.006*	.023	.034	.011

*In those cases when no metal was detected, one-half the minimum detectable limit (which varies from metal to metal) is reported, rather than zero.

FIGURE 54
METALS ANALYSIS DATA SUMMARY

4.2 Tennessee Department of Agriculture

The Department of Agriculture routinely monitors and analyzes samples of various media for pesticide residues. Samples are taken from dairy products, meat products, and other assorted media such as cake mixes, silage, feed, flour, and garden plants.

Table 100 shows the results of the Pesticide Residue Sampling Program for January 1971 through April 1975. PCB is the substance of interest. Analyses of dairy products, including raw milk, homogenized milk, cheese, and eggs, showed an overwhelming majority of the samples had no PCB contamination. Of the dairy samples showing PCB's, the highest value was 4.121 ppm. This value was found in raw milk with the analysis implications performed on a fat basis.

The beef products and other miscellaneous media also had a majority of values at zero. Of the values above zero, the highest was 2,160 ppm of PCB, found in a silage sample analyzed in 1973. No explanation has been obtained for the abnormally high value.

The Meat Inspection Section of the Department of Agriculture checks meat samples for arsenic on a regular basis. For the years 1971-1973, a total of 111 samples were analyzed for arsenic contamination. Only three samples had values above detectable limits. The values were 0.1, .15 and 0.2 ppm.

TABLE 100

TENNESSEE DEPARTMENT OF AGRICULTURE
PESTICIDE RESIDUE SAMPLING PROGRAM - PCB's (ppm)

YEAR	MEDIA	TOTAL NO. OF SAMPLES	NO. OF ZERO VALUES	VALUES >ZERO	RANGE VALUES > ZERO	AVERAGE OF VALUES > ZERO
1971	Raw Milk	234	234	-	-	-
1971	Homogenized Milk	157	157	-	-	-
1971	Cheese & Eggs	20	15	5	0.36-0.45	0.39
1971	Beef, Pork, & Other Meats	98	98	-	-	-
1971	Miscellaneous Media	24	24	-	-	-
1972	Raw Milk	375	344	31	0.025-0.478	0.19
1972	Beef, Pork, & Other Meats	70	69	1	0.4	0.4
1972	Miscellaneous Media	12	12	-	-	-
1973	Raw Milk	262	226	36	0.01-4.5	0.368
1973	Beef, Pork, & Other Meats	59	57	2	0.010-3.75	1.875
1973	Miscellaneous Media	31	19	11	0.032-2,160	271.032
1974	Raw Milk	228	218	10	0.01-2.39	0.438
1974	Beef, Pork, & Other Meats	164	163	1	1.33	-
1974	Miscellaneous Media	66	61	5	0.05-1652.4	315.975
1975	Raw Milk	24	24	-	-	-
1975	Beef, Pork, & Other Meats	65	65	-	-	-
1975	Miscellaneous Media	44	44	-	-	-

4.3 Tennessee Game and Fish Commission

Two annual progress reports were received from the Tennessee Fish and Game Commission. The first report covered the time span July 1, 1971 to June 30, 1972. The second report dealt with progress from July 1, 1972 through June 30, 1973.

The earlier report dealt with two specific tasks, one of which was to set up a pesticide monitoring program, and the other to investigate disease and pollution-caused fish kills. A considerable amount of PCB data was obtained from this report as a result of the pesticide monitoring program, and is summarized in Table 101. This report tentatively concluded that more pesticides were found in the 1971 samples than in any taken in previous years. The PCB levels are of particular concern in six out of about 57 different species in which average values exceed existing F.D.A. standards of 5.0 ppm. Catfish, carp, and carpsuckers show particularly high levels of PCB with channel catfish averaging 20.53 ppm in Fort Loudon Reservoir.

The progress report for the following year was essentially a follow-on to the aforementioned study, with the addition of a new task, fresh water mussel investigations. Again, data of interest was found in the pesticide monitoring section. The PCB monitoring data is summarized in Table 102. Ten species, two from Fort Loudon, one from Guntersville, one from Cheatham, one from Kentucky Lake, two from Cherokee, and three from Little River, showed average values in excess of the 5 ppm limit. Some limited metals analyses were performed for lead, zinc, cadmium, arsenic, and mercury in the brain, liver, kidney, muscle, and gonads of two rockfish taken from the Cherokee Reservoir. The results are shown in Table 103. Although none of the values of the metals were high enough to kill the fish, their affect on people and the general well being of the fish are unknown at this time. The analyses for metals were performed with atomic absorption spectrophotometry.

TABLE 101

SUMMARY OF AVERAGE PCB CONTENT BY SPECIES BY BODY OF WATER, 1971

STATION	SPECIES	NO. OF SAMPLES	PCB (ppm)
Fort Loudon	Carp	5	* 8.97
	Channel Catfish	5	* 20.53
	Largemouth Bass	4	4.97
	Spotted Bass	1	4.37
	Bluegill	5	4.01
Guntersville	Carp	2	2.64
	Buffalo	3	2.97
	Bluegill	5	2.37
	Largemouth Bass	4	3.26
	Spotted Bass	1	* 8.23
	Channel Catfish	3	* 8.70
Duck River	Carp	3	1.86
	Carpsucker	2	1.77
	Channel Catfish	5	0.20
	Bass	5	0.28
	Bluegill	5	0.27
Cheatham (below Nash.)	Carp	5	* 9.46
	Bullhead	1	2.16
	Largemouth Bass	3	3.61
	Spotted Bass	2	2.71
	Bluegill	5	2.91

TABLE 101 (continued)

SUMMARY OF AVERAGE PCB CONTENT BY SPECIES BY BODY OF WATER, 1971

STATION	SPECIES	NO. OF SAMPLES	PCB (ppm)
Bush Lake	Carp	5	0.15
	Channel Catfish	5	0.32
	Largemouth Bass	3	0.22
	Bluegill	5	0.09
Kentucky Reservoir	Carp	5	1.36
	Blue Catfish	1	0.58
	Channel Catfish	3	2.71
	Largemouth Bass	4	1.46
	White Crappie	5	0.60
	Bluegill	5	0.57
Forked Deer	Carp	5	0.93
	Channel Catfish	1	1.04
	Longnose Gar	1	0.042
	Gizzard Shad	5	2.08
	Largemouth Bass	2	0.12
	White Crappie	3	0.12
Hatchie River	Carp	1	2.5
	Bullhead	1	0.12
	Gizzard Shad	5	1.17
	Largemouth Bass	3	0.32
	White & Black Crappie	4	0.25
	Bluegill	5	0.17

TABLE 101 (continued)

SUMMARY OF AVERAGE PCB CONTENT BY SPECIES BY BODY OF WATER, 1971

STATION	SPECIES	NO. OF SAMPLES	PCB (ppm)
Obion River	Carp	4	2.08
	Longnose Gar	5	1.45
	Gizzard Shad	5	2.83
	Carpsucker	1	* 7.71
	Drum	4	1.37
	Bluecat	1	0.83
Reelfoot**	Largemouth Bass	2	0.83
	Bowfin	1	0.050
	Yellow Bass	2	0.100
	Channel Catfish	3	0.14
	Bullhead	1	None Detected
	Bluegill	5	0.05
	White Crappie	5	0.033
	Black Crappie	5	0.042

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*Value Exceeds F.D.A. Standard of 5.0 ppm
**Samples Suspect - lateness of sample 1/8/72

TABLE 102

SUMMARY OF AVERAGE PESTICIDE CONTENT BY SPECIES BY BODY OF WATER, 1972

STATION	SPECIES	NO. OF SAMPLES	PCB (ppm)
Fort Loudon	Bluegill	5	2.33
	Carp	5	4.37
	Smallmouth Bass	3	* 8.07
	Largemouth Bass	3	3.46
	Drum	3	3.23
	Channel Catfish	5	*11.70
Guntersville	Redear	5	1.93
	Largemouth Bass	5	1.50
	Smallmouth Buffalo	5	4.22
	Channel Catfish	5	*16.70
Duck River	Carp	5	1.93
	Spotted Bass	5	0.49
	Bluegill	5	0.25
	Bullhead	5	0.08
Cheatham	Bluegill	5	1.83
	Largemouth Bass	5	3.41
	Carp	5	* 7.03

TABLE 102 (continued)

SUMMARY OF AVERAGE PESTICIDE CONTENT
BY SPECIES BY BODY OF WATER, 1972

STATION	SPECIES	NO. OF SAMPLES	PCB (ppm)
Kentucky Lake	White Bass (female)	5	2.24
	White Bass (eggs)	10	1.25
	White Bass (male)	5	3.65
	White Bass (testes)	10	0.13
	Carp	5	* 5.21
	Bluegill	5	0.62
	White Crappie	5	0.49
	Largemouth Bass	5	2.08
	Channel Catfish (small)	5	1.12
Cherokee	Bluegill	5	0.70
	Largemouth Bass	5	3.96
	Smallmouth Bass	3	3.13
	Carp	5	0.98
	Rockfish (medium)	1	* 7.81
	Rockfish (small)	1	2.81
	Rockfish (medium)	1	* 6.51
	Hybrid Rockfish (medium)	1	4.32
	Hybrid Rockfish (medium)	1	2.08

TABLE 102 (continued)

SUMMARY OF AVERAGE PESTICIDE CONTENT BY SPECIES BY BODY OF WATER, 1972

STATION	SPECIES	NO. OF SAMPLES	PCB (ppm)
Little River	White Sucker	4	* 7.97
	Channel Catfish	4	*27.30
	Bluegill	3	* 9.48
Reelfoot	Bluegill	5	0.13
	Largemouth Bass (small)	3	0.13
	Yellow Bass	5	0.17
	Channel Catfish (small)	3	0.83
	Bullhead	2	0.17
	White Crappie (small)	5	0.058
	Black Crappie (small)	5	0.13

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*Value Exceeds F.D.A. Standard of 5.0 ppm

TABLE 103

RESULTS OF HEAVY METALS ANALYSIS OF ORGANS
FROM CHEROKEE ROCKFISH, FALL 1972

Mercury

Tissue	PROGRAM A	PROGRAM B
Brain	<0.10 ppm	<0.10 ppm
Liver	0.98 ppm	0.88 ppm
Kidney	0.29 ppm	0.33 ppm
Muscle	0.67 ppm	0.60 ppm
Gonads	0.45 ppm	0.26 ppm

Arsenic

Tissue	PROGRAM A	PROGRAM B
Brain	1.1 ppm	1.3 ppm
Liver	1.2 ppm	1.0 ppm
Kidney	0.62 ppm	0.59 ppm
Muscle	0.25 ppm	0.26 ppm
Gonads	0.46 ppm	0.58 ppm

Cadmium

Tissue	PROGRAM A	PROGRAM B
Brain	<0.05 ppm	1.1 ppm
Liver	0.08 ppm	<0.05 ppm
Kidney	0.20 ppm	<0.10 ppm
Muscle	<0.05 ppm	<0.05 ppm
Gonads	<0.05 ppm	<0.05 ppm

Zinc

Tissue	PROGRAM A	PROGRAM B
Brain	4.8 ppm	12.9 ppm
Liver	31.0 ppm	15.0 ppm
Kidney	12.9 ppm	10.5 ppm
Muscle	3.1 ppm	3.4 ppm
Gonads	20.3 ppm	20.3 ppm

A = 14 lb.-6 yr. old rock
B = 10 lb.-5 yr. old rock

TABLE 103 (continued)

RESULTS OF HEAVY METALS ANALYSIS OF ORGANS FROM CHEROKEE ROCKFISH, FALL 1972

	Lead	
Tissue	PROGRAM A	PROGRAM B
Brain	<0.3 ppm	<0.8 ppm
Liver	<0.2 ppm	<0.2 ppm
Kidney	<0.8 ppm	<0.6 ppm
Muscle	<0.2 ppm	<0.2 ppm
Gonads	<0.2 ppm	<0.2 ppm

A = 14 lb.-6 yr. old rock
B = 10 lb.-5 yr. old rock

5.0 NEW YORK AGENCY DATA ANALYSIS

5.1 New York State - Nassau County Department of Health

Nassau County has been involved in two programs that monitored toxic substance content. The blood lead data program was established to correlate the lead level in blood to the lead level in water from corrosion of lead service lines. The water data program was designed to assess the need for corrosion control programs in Nassau County.

The blood lead data was collected during the Spring of 1971, while the lead levels in water data was collected between 1971 and 1974.

Residents serviced with leaded service lines had blood lead levels higher than those residents serviced by non-leaded lines. Mean values were 24 μg/100 ml and 13 μg/100 ml. Lead content in water flowing from leaded service lines had a mean value of 0.10 (mg/l). These results show that people drinking water from leaded pipes have a higher blood lead level than those who are serviced from non-leaded pipes.

The analysis of the water supply distribution system data showed that levels of copper averaged .44 mg/l while lead levels averaged 0.128 mg/l. Both of these values exceeded the U.S. Public Service limit of 0.05 mg/l. Table104 shows the comparative statistics of this survey.

TABLE 104

NASSAU CO. HEALTH DEPT. LEAD STUDY

RESIDENTS WITH LEADED SERVICE LINES

Pb IN BLOOD (μg/100 ml)

NO. OF SAMPLES	RANGE	MEAN	STANDARD DEVIATION
24	14-39	24.67	9.59

RESIDENTS WITH NON-LEADED SERVICE LINES

Pb IN BLOOD (μg/100 ml)

NO. OF SAMPLES	RANGE	MEAN	STANDARD DEVIATION
27	5-21	13.75	4.75

RESIDENTS WITH LEADED SERVICE LINES

Pb IN WATER (mg/l)

NO. OF SAMPLES	RANGE	MEAN	STANDARD DEVIATION
12	0.01-0.29	.095	.08

WATER SUPPLY DISTRIBUTION SYSTEM DATA

(mg/l)

NO. OF SAMPLES	TOXIC SUBSTANCE	RANGE	MEAN	STANDARD DEVIATION
407	Cu	<0.05-2.25	.383	.440
398	Pb	<0.02-0.69	.068	.111

5.2 City of New York - Environmental Protection Administration, Department of Water Resources

The above-mentioned agency supplied the annual report of the Bureau of Water Supply for the years 1971, 1972, and 1973. The Water Quality Control Division is responsible for the direction and control of all phases of treatment, purification, sanitation and monitoring of the New York City water supply system extending from the upland watersheds 125 miles north down into the distribution network of mains in the five boroughs of the city.

The water supply bureau checks for trace metals in various portions of its water quality surveillance program. The number of sampling stations for chemical characteristics in 1971, 1972, and 1973 was 14, 13, and 13 respectively. As can be seen from the values of CN, As, Cd, Cr^{+6}, Hg, and Pb, in Tables 105 through 111, the sanitary quality of the distribution system conforms to the water standards promulgated by the U.S. Public Health Service in 1962.

In 1972 and 1973 the Department of Water Resources undertook a survey of trace elements in the New York upstate watershed. Tables 28 and 29 display the average, minimum, and maximum for the elements that were of interest to OTS, As, Cd, Cr, Hg, and Pb. As can be seen from the tables, none of the values were significantly high, and no problem is foreseen in the future.

TABLE 105

RANGE AND AVERAGE - REPRESENTATIVE SAMPLING STATIONS - 1971

TRACE METAL mg/1	SILVER LAKE EFFL		J.P.RES GH5		J.P.RES GH7		135th St. GH	
	RANGE	MEAN	RANGE	MEAN	RANGE	MEAN	RANGE	MEAN
Cyanide	.000-.003	.001	.000-.007	.004	.001-.005	.003	.001-.005	.003
Arsenic	.0003-.0006	.0004	.0005-.0008	.0006	.0004-.0008	.0006	.0005-.0006	.0005
Cadmium	.00-.00	.00	.00-.00	.00	.00-.00	.00	.00-.00	.00
Chromium^{+6}	.00-.00	.00	.00-.00	.00	.00-.00	.00	.00-.00	.00
Mercury	<.001-<.001	<.001	<.001-<.001	<.001	<.001-<.001	<.001	<.001-<.001	<.001
Lead	.00-.00	.00	.00-.00	.00	.00-.00	.00	.00-.00	.00

TRACE METAL mg/1	C.P.RES EFFL		101 AV-90 ST 637		MERRICK & HILLSIDE 782		189 & HILLSIDE 783	
	RANGE	MEAN	RANGE	MEAN	RANGE	MEAN	RANGE	MEAN
Cyanide	.000-.005	.002	.001-.003	.002	.000-.003	.002		
Arsenic	.0004-.0008	.0006	<.001-<.001	<.001	<.001-<.001	<.001	<.001-<.001	<.001
Cadmium	.00-.00	.00	.00-.00	.00	.00-.00	.00	.00-.00	.00
Chromium^{+6}	.00-.00	.00	.00-.00	.00	.00-.00	.00	.00-.00	.00
Mercury	<.001-<.001	<.001	<.001-<.001	<.001	<.001-<.001	<.001	<.001-<.001	<.001
Lead	.00 .00	.00	.00-.00	.00	.00-.00	.00	.00-.00	.00

TABLE 105 (continued)

RANGE AND AVERAGE - REPRESENTATIVE SAMPLING STATIONS - 1971

TRACE METAL mg/l	SHAFT 2		SHAFT 3A		SHAFT 9A	
	RANGE	MEAN	RANGE	MEAN	RANGE	MEAN
Cyanide	.000-.009	.004	.000-.005	.002	.000-.003	.001
Arsenic	.0003-.0008	.0005	.0002-.0009	.0004	.0002-.0008	.0005
Cadmium	.00-.00	.00	.00-.00	.00	.00-.00	.00
Chromium^{+6}	.00-.00	.00	.00-.00	.00	.00-.00	.00
Mercury	<.001-<.001	<.001	<.001-<.001	<.001	<.001-<.001	<.001
Lead	.00-.00	.00	.00-.00	.00	.00-.00	.00

TRACE METAL mg/l	SHAFT 15A		SHAFT 24		S.R. EFFL	
	RANGE	MEAN	RANGE	MEAN	RANGE	MEAN
Cyanide	.000-.006	.002	.001-.005	.003	.000-.000	.000
Arsenic	.0003-.0005	.0004	.0004-.0007	.0006		.0003
Cadmium	.00-.00	.00	.00-.00	.00	.00-.00	.00
Chromium^{+6}	.00-.00	.00	.00-.00	.00	.00-.00	.00
Mercury	<.001-<.001	<.001	<.001-<.001	<.001	<.001-<.001	<.001
Lead	.00-.00	.00	.00-.00	.00	.00-.00	.00

Courtesy New York City Environmental Protection Administration

TABLE 106

RANGE AND AVERAGE - REPRESENTATIVE SAMPLING STATIONS - 1972

TRACE METAL mg/1	SHAFT 2		SHAFT 3A		SHAFT 9A		SHAFT 15A	
	RANGE	MEAN	RANGE	MEAN	RANGE	MEAN	RANGE	MEAN
Cyanide		.002		.002		.003		
Arsenic		<.001		<.001		<.001		
Cadmium		.00		.00		.00		00
Chromium^{+6}	.00-.00	.00	.00-.00	.00	.00-.00	.00	.00-.00	.00
Mercury		<.001		<.001		<.001		<.001
Lead	.00-.00	.00	.00-.00	.00	.00-.00	.00	.00-.00	.00

TRACE METAL mg/1	SHAFT 24		R.R. EFFL		SILVER LAKE EFFL		J.P.RES GH7	
	RANGE	MEAN	RANGE	MEAN	RANGE	MEAN	RANGE	MEAN
Cyanide						.002		.003
Arsenic		<.001		<.001		<.001		<.001
Cadmium		.00		.00		.00		.00
Chromium^{+6}	.00-.00	.00	.00-.00	.00	.00-.00	.00	.00-.00	.00
Mercury		<.001		<.001		<.001		<.001
Lead	.00-.00	.00	.00-.00	.00	.00-.00	.00	.00.00	.00

TABLE 106

RANGE AND AVERAGE - REPRESENTATIVE SAMPLING STATIONS - 1972 (continued)

TRACE METAL mg/1	J.P.RES GH5 RANGE	J.P.RES GH5 MEAN	135th St GH RANGE	135th St GH MEAN	C.P.EFFL RANGE	C.P.EFFL MEAN	101-12 JAMAICA AVE G39 RANGE	101-12 JAMAICA AVE G39 MEAN	NO CONDUIT SPRINGFIELD BLVD 790 RANGE	NO CONDUIT SPRINGFIELD BLVD 790 MEAN
Cyanide				.003						
Arsenic		<.001		<.001		<.001		<.001		<.001
Cadmium		.00		.00		.00		.00		.00
Chromium^{+6}	.00-.00	.00	.00-.00	.00	.00-.00	.00		.00		.00
Mercury		<.001		<.001		<.001		<.001		<.001
Lead	.00-.00	.00	.00-.00	.00	.00-.00	.00	.00-.00	.00	.00-.00	.00

Courtesy New York City Environmental Protection Administration

TABLE 107

RANGE AND AVERAGE - REPRESENTATIVE SAMPLING STATIONS - 1973

TRACE METAL mg/1	SHAFT 2		SHAFT 3A		SHAFT 9A	
	RANGE	MEAN	RANGE	MEAN	RANGE	MEAN
Cyanide	<.001-.001	<.001	<.001-.001	<.001	<.001-.001	<.001
Arsenic	<.001-.002	<.001	<.001-.001	<.001	<.001-.002	.001
Cadmium	.00-.00	.00	.00-.00	.00	.00-.00	.00
Chromium^{+6}	.00-.00	.00	.00-.00	.00	.00-.00	.00
Mercury	<.001-<.001	<.001	<.001-<.001	<.001	<.001-<.001	<.001
Lead	.00-.00	.00	.00-.00	.00	.00-.00	.00

TRACE METAL mg/1	SHAFT 15A		SHAFT 24		R.R. EFFL	
	RANGE	MEAN	RANGE	MEAN	RANGE	MEAN
Cyanide	<.001-.001	<.001	<.001-.001	<.001	<.001-.001	.001
Arsenic	.000-.002	.001	<.001-.002	.001	<.001-.002	.001
Cadmium	.00-.00	.00	.00-.00	.00	.00-.00	.00
Chromium^{+6}	.00-.00	.00	.00-.00	.00	.00-.00	.00
Mercury	<.001- .001	<.001	<.001-<.001	<.001	<.001-<.001	<.001
Lead	.00-.00	.00	.00-.00	.00	.00-.00	.00

TABLE 107 (continued)

RANGE AND AVERAGE - REPRESENTATIVE SAMPLING STATIONS - 1973

TRACE METAL mg/1	SILVER LAKE EFFL		J.P. RES GH7		J.P. RES GH5	
	RANGE	MEAN	RANGE	MEAN	RANGE	MEAN
Cyanide	<.001-.001	.001	<.001-.001	<.001	<.001-.001	.001
Arsenic	.000-<.001	.000	.000-<.001	<.001	.000- .001	.000
Cadmium	.00-.00	.00	.00-.00	.00	.00-.00	.00
Chromium^{+6}	.00-.00	.00	.00-.02	.02	.00-.00	.00
Mercury	<.001-<.001	<.001	<.001-<.001	<.001	<.001-<.001	<.001
Lead	.00-.00	.00	.00-.00	.00	.00-.00	.00

TRACE METAL mg/1	135th St GH		C.P. RES EFFL		UTILITIES & INDUSTRIES		JAMAICA WATER Co.(790)	
	RANGE	MEAN	RANGE	MEAN	RANGE	MEAN	RANGE	MEAN
Cyanide	<.001-.001	.001	<.001-.001	.001	<.001-.001	<.001	<.001-.001	<.001
Arsenic	.000-<.001	.000	.000-<.001	.001	<.001- .002	.001	<.000-.001	<.001
Cadmium	.00-.00	.00	.00-.00	.00	.00-.00	.00	.00-.00	.00
Chromium^{+6}	.00-.00	.00	.00-.03	.01	.00-.01	.00	.00-.00	.00
Mercury	<.001-<.001	<.001	<.001-<.001	<.001	<.001-<.001	<.001	<<.001-<.001	<.001
Lead	.00-.00	.00	.00-.00	.00	.00-.01	.01	.00- .01	.00

Courtesy New York City Environmental Protection Administration

TABLE 108

TRACE ELEMENT STUDIES IN UPSTATE WATERSHED - 1972

LOCATION		As	Cd	Cr	Hg	Pb
Schoharie Ck below Prattsville	AVER		<.005	<.02	<.002	<.01
	MAX		<.005	<.02	<.002	.01
	MIN		<.005	<.02	<.002	<.01
Schoharie Res. Intake	AVER		<.005	<.02	<.003	<.01
	MAX		<.005	<.02	.007	.01
	MIN		<.005	<.02	<.002	<.01
Esopus Creek at Boiseville	AVER		<.005	<.02	<.002	<.01
	MAX		<.005	<.02	.004	.01
	MIN		<.005	<.02	<.002	<.01
Ashokan Res. CL - EFF	AVER		<.005	<.02	.002	<.01
	MAX		<.005	<.02	.008	<.01
	MIN		<.005	<.02	<.002	<.01
West Branch Beersten	AVER		<.005	<.02	.002	.015
	MAX		<.005	<.02	.004	.03
	MIN		<.005	<.02	<.002	<.01
East Branch Delaware below Margaretville	AVER		<.01	<.02	.002	.01
	MAX		.045	<.02	.0009	.04
	MIN		<.005	<.02	<.002	<.01
Neversink EFF Grahamsville	AVER		<.005	<.02	.007	.01
	MAX		<.005	.03	.068	.37
	MIN		<.005	<.02	<.002	.01
Rondout Gaging Str.	AVER		<.005	<.02	<.002	.01
	MAX		<.005	<.02	<.002	.02
	MIN		<.005	<.02	<.002	.00
Rondout EFF Laskawack	AVER		<.005	<.02	.002	.075
	MAX		.02	<.02	.004	.02
	MIN		<.005	<.02	<.002	.00
W. Delaware Tunnel Outlet	AVER		<.005	<.02	<.002	.01
	MAX		<.005	<.02	<.002	.02
	MIN		<.005	<.02	<.002	.01

TABLE 108 (continued)

TRACE ELEMENT STUDIES IN UPSTATE WATERSHED - 1972

LOCATION		As	Cd	Cr	Hg	Pb
Cannonsville Res. ELEV COMP	AVER		<.005	<.02	.237	.03
	MAX		<.005	<.02	.004	.24
	MIN		<.005	<.02	.610	<.01
Rondout W. Br Sh17 CL	AVER	.006				.00
	MAX	.04				.00
	MIN	.00				.00
Delaware AQ Sh18 EFF	AVER	.003				.00
	MAX	.02				.00
	MIN	.00				.00
Pleasantville INFL.	AVER	.003				.00
	MAX	.02				.00
	MIN	.000				.00
Catskill EFF	AVER	.006				.00
	MAX	.04				.00
	MIN	.00				.00
Croton Lake EFF CHLOR	AVER	.005				.00
	MAX	.03				.00
	MIN	.00				.00

Courtesy New York City Environmental Protection Administration

TABLE 109

TRACE ELEMENT STUDIES IN UPSTATE WATERSHED - 1973

LOCATION		As	Cd	Cr	Hg	Pb
Schoharie Ck below Prattsville	AVER		<.0005	.002	<.0002	<.001
	MAX		<.0005	.002	<.0002	<.001
	MIN		<.0005	.002	<.0002	<.001
Schoharie Res. Intake	AVER		<.0005	<.002	<.0002	<.001
	MAX		<.0005	<.002	.001	<.001
	MIN		<.0005	.002	<.0002	<.001
Esopus Creek at Boiseville	AVER		<.0005	<.002	<.0002	<.01
	MAX		<.001	<.002	<.0002	<.01
	MIN		<.0005	<.002	<.0002	<.01
Ashokan Res. CL - EFFL	AVER		<.0005	<.002	<.0002	<.01
	MAX		<.0005	<.002	.001	<.01
	MIN		<.0005	<.002	<.0002	<.01
West Branch Beersten	AVER		<.0005	<.0002	.003	<.01
	MAX		.004	<.0004	.008	<.01
	MIN		<.0005	<.0002	.002	<.01
East Branch Delaware below Margaretville	AVER		<.0005	<.0002	.0003	<.01
	MAX		<.0002	<.0002	.0005	<.01
	MIN		<.0005	<.0002	<.0002	<.01
Neversink EFFL Grahamsville	AVER		<.0009	<.002	.0005	<.01
	MAX		<.008	<.003	.0022	<.01
	MIN		<.0005	<.002	<.0002	<.01
Rondout Ck Gaging Str.	AVER		<.0005	<.002	.0003	<.01
	MAX		<.0005	<.002	.0012	<.01
	MIN		<.0005	<.002	<.0002	<.01
Rondout EFFL Laskawack	AVER		<.0005	<.002	.0003	<.01
	MAX		<.0036	<.002	.0005	<.01
	MIN		<.0005	<.002	<.0002	<.01
W. Delaware Tunnel Outlet	AVER		<.0006	<.0002	.0012	<.01
	MAX		<.0025	<.0002	.0018	<.01
	MIN		<.0005	<.0002	.0007	<.01

TABLE 109 (continued)

TRACE ELEMENT STUDIES IN UPSTATE WATERSHED - 1973

LOCATION		As	Cd	Cr	Hg	Pb
Rondout W. Br SH17 CL (Influent to Kensico)	AVER	.000			.00	.00
	MAX	.000			.00	.00
	MIN	.000			.00	.00
Delaware AQ Sh18 EFFL CL (Effluent from Kensico)	AVER	.000			.00	.00
	MAX	.000			.01	.00
	MIN	.000			.00	.00
Pleasant-ville INFL	AVER	.000			.00	.00
	MAX	.000			.01	.00
	MIN	.000			.00	.00
Catskill EFFL	AVER	.000			.00	.00
	MAX	.000			.00	.00
	MIN	.000			.00	.00
Croton Lake EFFL CHLOR	AVER	.000			.00	.00
	MAX	.000			.00	.00
	MIN	.000			.00	.00

Courtesy New York City Environmental Protection Administration

TABLE 110

RANGE AND AVERAGE CHARACTERISTIC ANALYSES OF THE CATSKILL-DELAWARE AND CROTON SUPPLIES IN THE DISTRIBUTION SYSTEM

1972

mg/1	CATSKILL-DELAWARE RANGE	AVERAGE	CROTON RANGE	AVERAGE
Cyanide	.002-.003	.002	.002-.003	.003
Arsenic	<.001-.<001	<.001	<.001-<.001	<.001
Cadmium	.00 -.00	.00	.00 -.00	.00
Chromium^{+6}	.00-.00	.00	.00-.00	.00
Mercury	<.001-<.001	<.001	<.001-<.001	<.001
Lead	.00 -.00	.00	.00-.00	.00

RANGE AND AVERAGE CHARACTERISTIC ANALYSES OF THE CATSKILL-DELAWARE AND CROTON SUPPLIES IN THE DISTRIBUTION SYSTEM

1971

mg/1	CATSKILL-DELAWARE RANGE	AVERAGE	CROTON RANGE	AVERAGE
Cyanide	.000-.009	.002	.000-.007	.003
Arsenic	.000-.001	.001	.000-.001	.001
Cadmium	.00-.00	.00	.00-.00	.00
Chromium^{+6}	.00-.00	.00	.00-.00	.00
Mercury	<.001-<.001	<.001	<.001-<.001	<.001
Lead	.00-.00	.00	.00-.00	.00

Courtesy New York City Environmental Protection Administration

TABLE III

RANGE AND AVERAGE CHARACTERISTIC ANALYSES OF THE CATSKILL-DELAWARE AND CROTON SUPPLIES IN THE DISTRIBUTION SYSTEM

1973

TRACE ELEMENT mg/1	CATSKILL-DELAWARE RANGE	- AVERAGE	CROTON RANGE	- AVERAGE
Cyanide	<.001-.001	.001	<.001-.001	.001
Arsenic	.000-.002	.001	.000-<.001	.000
Cadmium	.000-.000	.000	.000-.000	.000
Chromium^{+6}	.00-.00	.00	.00-.00	.00
Mercury	<.001-<.001	<.001	<.001-<.001	<.001
Lead	.00-.01	.00	.00-.00	.00

Courtesy New York City Environmental Protection Administration

5.3 New York State Department of Environmental Conservation, Division of Air Resources

High volume sampling lead data was received from the state of New York for the year 1973. Lead data was also received for three sites sampled during the years 1970-1972.

Sampling for particulate lead in ambient air, using the high volume sampler, was started in New York state in 1970 with four stations. The network grew to 13 stations in 1972.

At a lead sampling station, two high volume samplers are run in parallel on the every sixth day schedule. One of them, using the glass fiber filter, samples for TSP* while the other samples for lead using a cellulose filter. Each sampler takes a 24-hour sample.

Annual averages for all the stations are displayed in Figure 55. Figure 55 shows TSP, lead in $\mu g/m^3$, and percent lead, which is calculated as percent of TSP collected by the parallel Hi-Vol sampler. The reduction from 1970 to 1973 in annual percent lead concentration varies from 19 percent at Buffalo (1401-18) to 36 percent at Roosevelt Island (7093-03).

MITRE has coded all the lead data for the year 1973 in SAROAD format and processed it with a statistical program. The results of this program are shown in Appendix A of Final Report Volume IV, Compilation of the Summaries and Analyses of State Data.

*Total suspended particulate

Station	Number	1970			1971			1972			1973		
		TSP[1]	Pb	%Pb	TSP	Pb	%Pb	TSP	Pb	%Pb	TSP	Pb	%Pb
Albany	0101-02										117	0.74	0.62
Jamestown	0602-03										54	0.27	0.50
Buffalo	1401-01										79	0.73	0.92
Buffalo	1401-18	126	1.02	0.81	136	0.93	0.68	113	0.94	0.82	110	0.73	0.66
Buffalo	1401-19										90	0.64	0.71
Rochester	2701-01										83	0.90	1.08
Eisenhower Pk	2950-10	89	1.98	2.22	99	1.83	1.85	68	1.40	2.06	88	1.34	1.52
Niagara Falls	3102-01										92	0.46	0.50
Utica	3202-01										70	0.53	0.76
Syracuse	3301-08										81	0.74	0.91
Mamaroneck	5956-01										62	1.08	1.74
Roosevelt Is.[2]	7093-03	97	1.42	1.47	90	1.06	1.18	82	0.90	1.09	78	0.73	0.94

[1] TSP = Total Suspended Particulates

[2] Formerly Welfare Island

FIGURE 55
NEW YORK STATE AMBIENT AIR LEAD DATA

5.4 New York State Department of Health

Two reports covering the periods of time from October 1970 to March 1971, and May 1971 to April 1972 were received and entitled "A Study of Chemicals in Drinking Water from Selected Public Water Systems." These reports were done in cooperation with the United States Geological Survey, therefore, a detailed statistical analysis will not be done as the data is sorted in the USGS data bank.

The first study dealt with water sampling done in the fall and winter months of 1970 to 1971 at selected distribution outlets of public drinking water systems across the state. The purpose of the study was to find out not only what chemicals may be found in some drinking waters of New York state but also the ranges of concentrations of these chemicals.

A conclusion of interest in this report was the difference noted between groundwater and surface water. No pesticides, for example, were detected in groundwater. It was determined that additional sampling would be needed to verify this tentative conclusion. It was recommended that a determination of the geographic distribution of the undesirable chemical constituents such as heavy metals could be beneficial in the study of possible relationships between certain diseases and public drinking water sources. The trace elements of interest that were studied are as follows.

- Arsenic
- Beryllium
- Cadmium
- Chromium
- Cyanide
- Lead
- Mercury
- PCB's

The second report dealt with the same area of studies as the first. It was found that pesticides and herbicides are not a problem in the state of New York. Arsenic was found above the acceptable limit in two systems, 12 miles apart, drawing from the same aquifer. The arsenic appeared to be naturally occurring.

It was also found that raw water samples, from lakes and reservoirs receiving man-made or natural discharges containing lead, showed seasonal increases.

It was recommended by this report that additional studies be undertaken to determine the source of the high concentration of arsenic in the groundwater, and also to study the seasonal variations in lead concentrations.

5.5 New York Department of Environmental Conservation, Fish and Wildlife Management

The data shown in Table 112 are the results of what was an ongoing mercury study in New York initiated in 1969. At the end of 1974, this program reached a state of dormancy and is currently being reevaluated. This particular data was obtained by sampling in Cranberry Lake in New York state.

The analyses for this project were done jointly by the New York Health Department and the environmental conservation department's Rome Pollution Laboratory.

As can be seen from the tables, only one fish 7.8 inches long and one fish 7.0 inches long was below 0.5 ppm Hg. Also, of ten legal sized smallmouth bass, nine exceeded the 0.5 ppm actionable Hg level.

TABLE 112
FISH AND WILDLIFE Hg STUDY*
MERCURY LEVELS IN CRANBERRY LAKE

Species	Item	1969	1970	1972	1974
Smallmouth bass	No.	3	2	24	24
	Size range (In.)	14.0-15.2	13.5-14.2	10.6-15.7	10.6-16.9
	Weight range (Lb.)	1.40-1.96	1.50-2.00	0.57-1.80	0.46-2.40
	Hg conc. range (ppm)	1.95-3.10	1.42-1.57	0.50-3.08	0.84-2.93
	X Hg conc. (ppm)	2.47	1.49	1.39	1.34
Yellow perch	No.	3	-	-	-
	Size range (In.)	10.5-11.5	-	-	-
	Weight range (Lb.)	0.49-0.61	-	-	-
	Hg conc. range (ppm)	1.33-2.18	-	-	-
	X Hg conc. (ppm)	1.65	-	-	-
Common white sucker	No.	-	3	-	-
	Size range (In.)	-	13.2-14.6	-	-
	Weight range (Lb.)	-	-	-	-
	Hg conc. range (ppm)	-	0.16-0.34	-	-
	X Hg conc. (ppm)	-	0.28	-	-

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*Courtesy New York State Fish and Wildlife

TABLE 112 (CONTINUED)

Species	Item	1971*	1974
Smallmouth bass	No.	3	17
	Size range (In.)	10.3-14.3	9.6-15.4
	Weight range (Lb.)	---------	0.44-1.81
	Range Hg conc. (ppm)	0.06-1.00	0.54-2.12
	$\bar{X}$ Hg conc. (ppm)	0.48	1.2
Splake	No.	2	7
	Size range (In.)	16.2-16.7	13.2-20.6
	Weight range (Lb.)	1.25-1.31	0.75-3.75
	Range Hg conc. (ppm)	0.80-1.30	0.95-2.74
	$\bar{X}$ Hg conc. (ppm)	1.05	1.62
Yellow perch	No.	2	7
	Size range (In.)	9.0-11.2	7.7-11.2
	Weight range (Lb.)	0.38-0.68	0.19-0.75
	Range Hg conc. (ppm)	0.70-2.80	0.58-1.81
	$\bar{X}$ Hg conc. (ppm)	1.75	1.24
Common white sucker	No.	15	-
	Size range (In.)	11.2-15.9	-
	Weight range (Lb.)	0.56-1.75	-
	Range Hg conc. (ppm)	0.17-1.10	-
	$\bar{X}$ Hg conc. (ppm)	0.52	-
Longnose sucker	No.	2	-
	Size range (In.)	15.2-17.3	-
	Weight range (L .)	1.06-1.69	-
	Range Hg conc. (ppm)	0.92-1.10	-
	$\bar{X}$ Hg conc. (ppm)	1.01	-
Whitefish	No.	1	-
	Size range (In.)	13.6	-
	Weight range (Lb)	0.81	-
	Range Hg conc. (ppm)	0.37	-
	$\bar{X}$ Hg conc. (ppm)	0.37	-

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*Health Department analysis in 1971.

TABLE 112 (CONTINUED)

Species	Item	1970[1]	1972	1973	1974
White perch	No.	-	7[2]	34[3]	30
	Size range (In.)	-	7.5-10.0	7.0-11.1	7.0-10.2
	Weight range (Lb.)	-	0.42-0.84	0.12-0.87	0.19-0.71
	Range Hg conc. (ppm)	-	0.49-3.55	0.36-2.65	0.20-2.65
	$\bar{X}$ Hg conc. (ppm)	-	2.11	1.43	0.90
Smallmouth bass	No.	-	16	-	22[4]
	Size range (In.)	-	8.5-13.5	-	7.0-13.0
	Weight range (Lb.)	-	0.43-1.31	-	0.17-1.25
	Range Hg conc. (ppm)	-	0.61-2.23	-	0.21-1.40
	$\bar{X}$ Hg conc. (ppm)	-	1.26	-	0.81
Walleye	No.	-	-	5	4
	Size range (In.)	-	-	11.4-22.1	18.5-21.0
	Weight range (Lb.)	-	-	0.44-4.35	3.63-8.26
	Range Hg conc. (ppm)	-	-	1.15-7.91	1.25-2.61
	$\bar{X}$ Hg conc. (ppm)	-	-	5.76	1.96
Yellow Perch	No.	2	2	2	1
	Size range (In.)	9.25-9.75	8.5-9.5	7.0-7.5	9.0
	Weight range (Lb.)	0.53-0.63	0.31 avg	0.21-0.25	0.41
	Range Hg conc. (ppm)	3.5-8.2	1.56-2.39	0.69-0.71	0.60
	$\bar{X}$ Hg conc. (ppm)	5.8	1.98	0.70	0.60
Brown bullhead	No.	3	2		
	Size range (In.)	10.0-11.2	11.0-12.8	-	-
	Weight range (Lb.)	-	0.25-0.37	-	-
	Range Hg conc. (ppm)	4.0-4.1	2.16-2.47	-	-
	$\bar{X}$ Hg conc. (ppm)	4.03	3.32	-	-
Black crappie	No.	2	4	4	1
	Size range (In.)	9.0-9.8	7.6-10.7	6.5-8.5	9.4
	Weight range (Lb.)	-	0.40-0.77	0.21-0.39	0.43
	Range Hg conc. (ppm)	1.0-2.2	0.31-1.47	0.33-0.55	0.76
	$\bar{X}$ Hg conc. (ppm)	1.60	0.79	0.45	0.76

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(1)Health Dept. analysis, all others by Environmental Conservation Department's Rome Pollution Laboratory.
(2)Only one fish 7.8" long below 0.5 ppm Hg.
(3)Only one fish 7.0" long below 0.5 ppm Hg.
(4)Of 10 legal sized smallmouth bass, 9 exceeded the 0.5 ppm actionable Hg. level.

5.6 New York State Department of Environmental Conservation, Division of Pure Waters

A compilation of all water quality information concerning toxic substances data was received from the Division of Pure Waters, which acts as a central repository for New York State. This data bank facilitates the fulfillment of the water quality data needs of all various entities concerned.

The majority of the heavy metals data contained in the data sheets has already been entered into the USGS data bank, or the EPA files. The small portion of the data not included in these data banks was analyzed statistically by MITRE. The results are shown in Table 113.

TABLE 113

NEW YORK STATE WATER QUALITY DATA

μg/1

	NO. OF SAMPLES	MINIMUM	MAXIMUM	MEAN	STANDARD DEVIATION
1972					
CADMIUM	3	0	10.0	5.0	-
CHROMIUM	6	0	20.0	6.66	-
CYANIDE	4	0	10.0	2.5	-
1973					
CADMIUM	17	0	11.0	2.47	2.7
CHROMIUM	21	0	10.0	2.38	4.36
CYANIDE	19	.01	40.0	7.37	11.94
1974					
CADMIUM	96	0	15.0	1.09	2.06
CHROMIUM	97	0	20.0	9.28	5.25
CYANIDE	7	0	10.0	4.29	5.35
ARSENIC	2	1.0	1.0	1.0	-
MERCURY	2	.5	.5	.5	-
LEAD	2	4.0	9.0	6.5	-
1975					
CADMIUM	19	1.0	17.0	4.26	4.65
CHROMIUM	19	0.0	10.0	4.74	5.13

5.7 New York State Department of Environmental Conservation

The above-mentioned agency with the help of Cornell University did a study of the arsenic content of fish from New York state waters in 1969. A survey was taken of 471 fish sampled in 1969 from 49 New York state waters for total arsenic content. Arsenic levels ranged up to about 0.5 ppm with fish from Lake Ontario, Cananbaigua Lake and the Hudon, St. Lawrence and Salmon Rivers being relatively higher. Larger fish generally contained higher arsenic concentrations. Arsenic did not appear to be cumulative with increasing age in lake trout ranging from two to 11 years old.

5.8 New York State Department of Health, Division of Laboratories and Research Environmental Health Center

A landfill leaching survey was begun in the State of New York in 1972 examining surface and groundwater for As, Be, Cd, Cr, Pb, Hg and CN. Table 114 shows the statistical analysis performed on the raw data by MITRE. The samples were taken in various surface and groundwater locations receiving landfill leachate in the state of New York. This survey is still being conducted in New York.

TABLE 114
NEW YORK STATE DEPARTMENT OF HEALTH LANDFILL LEACHING SURVEY
mg/1

TRACE METAL	1972					1973					1974					1975				
	# OF SAMP	MIN	MAX	MEAN	STD. DEV.	# OF SAMP	MIN	MAX	MEAN	STD. DEV.	# OF SAMP	MIN	MAX	MEAN	STD. DEV.	# OF SAMP	MIN	MAX	MEAN	STD. DEV.
As						7	.02	.02	.02	0.0	8	.02	.05	.03	.004	7	.01	.05	.081	.185
Be						14	.02	.25	.048	.063	6	.02	.02	.02	0.0	NO SAMPLES				
Cd	2	.05	.05	.05	0	18	.005	.05	.023	.022	32	.002	.14	.023	.0224	8	.002	.02	.011	.009
Cr	2	.1	.1	.1	0	23	.01	.28	.084	.059	30	.01	.9	.14	.171	8	.01	.1	.057	.048
Pb	2	.1	.1	.1	0	14	.01	.2	.107	.046	27	.1	.1	.1	0.0	7	.02	.18	.086	.059
Hg						10	.0004	.0016	.0006	.0004	16	.0004	.0008	.0004	.0001	5	.0004	.0004	.0004	0.0
Cn						2	.01	.01	.01	0.0	4	.1	.1	.1						

6.0 IDAHO AGENCY DATE ANALYSIS

6.1 Idaho State Department of Fish and Game and Department of Health

During the years 1970-1971, the above-mentioned agencies jointly conducted a study entitled "Mercury Levels in Idaho Fishes and Aquatic Environments, 1970-1971." The Idaho Fish and Game Department collected 1,096 fish, 3 samples of aquatic organisms, 60 water samples, and 17 sediment samples from 93 geographical locations to determine the extent of mercury contamination in Idaho waters. Neutron activation and atomic absorption were used in 1970 and 1971, respectively. Mercury occurrence in Idaho waters was found to be widespread, although the sources were not pinpointed.

Of the twenty-six species of fish analyzed, piscivorous fish had higher mercury levels than fish with plankton insect diets. Nongame warmwater fish contained approximately twice the mercury levels found in coldwater (trout and whitefish) gamefish species. Fish sampled from reservoirs contained higher mercury levels than fish sampled from reservoir tributaries. The highest mercury concentration measured in the 1,096 sampled was 1.70 ppm in a squawfish. Fifty-nine fish or 5.3 percent of the total number of fish collected exceeded the 0.50 ppm F.D.A. level. However, over half of these were nongame species and were infrequently used by fishermen.

Table 115 displays the wide variance found in mercury contents between species inhabiting the same water. This seems to be attributable to feeding habits. Insect/plankton fish species and young piscivorous species still feeding on vegetation had

TABLE 115
MERCURY RESIDUES IN IDAHO FISHES BY SPECIES, 1970-1971

Species	Sample No.	Aver. - Hg ppm
Coldwater Species		.112
Hatchery Rainbow	41	.057
Wild Rainbow	218	.094
Steelhead - Juvenile (Hatchery)	20	.050
Steelhead - Juvenile (Wild)	10	.008
Steelhead - Adult	10	.140
Kamloops - Adult	10	.482
Cutthroat	66	.106
Dolly Varden	9	.533
Brook Trout	3	.127
Brown Trout	3	.438
Kokanee	25	.074
Coho (Resident)	14	.068
Chinook - Juvenile (Wild)	8	.194
Chinook - Juvenile (Hatchery)	10	.116
Chinook - Adult	5	.051
Whitefish	95	.121
Cisco	10	.088
Warmwater Species		.211
Largemouth Bass	3	.367
Smallmouth Bass	23	.190
Sunfish	10	.175
Crappie	33	.138
Yellow Perch	96	.242
Channel Catfish	38	.214
Bullhead Catfish	5	.150

TABLE 115 (CONTINUED)

Species	Sample No.	Aver. - Hg ppm
Nongame Species		.217
Squawfish	39	.247
Utah Chub	38	.276
Peamouth Chub	2	.250
Chiselmouth Chub	9	.142
Redside Shiner	10	.074
Carp	61	.167
Sucker	172	.227

consistently lower mercury levels. For example, a rainbow trout less than two pounds collected from American Falls Reservoir averaged 0.256 ppm mercury while larger rainbow and cutthroat trout five to six pounds in weight averaged 0.910 ppm and 0.822 ppm respectively.

Table 116 shows a comparison of mercury levels in reservoir fish and fish in reservoir tributaries. Movement of stream sediment and running water may inhibit the methylization of mercury, resulting in lower mercury levels in stream fish.

Fish were tested from one national fish hatchery and seven Idaho fish and game hatcheries. Table 117 shows that the mercury residues ranged from <0,002 ppm to 0.186 ppm. Analysis of dry fish feed constituents used in the Idaho Fish and Game Department feed formula showed herring meal to be highest in mercury residue (Table 118).

6.2 Environmental Improvement Division - Idaho Department of Health

A report was received from the above-mentioned agency entitled "Water Quality Survey - Coeur D'Alene River - Coeur D'Alene Lake". The Coeur d'Alene river and lake have been periodically examined to determine the chemical quality of the water and the composition of the aquatic biota.

Two of the toxic substances of interest, lead and cadmium, were analyzed for in this survey. In the Coeur d'Alene River system, significantly high concentrations of lead were present in Canyon Creek, Nine Mile Creek, Government Gulch, and the lower part of the

TABLE 116
COMPARISON OF MERCURY RESIDUES IN STREAM AND RESERVOIR FISHES

Location	Species	Average - Hg ppm
Big Wood River	Rainbow	.014
Magic Reservoir	Rainbow	.052
Big Lost River	Rainbow	.073
Mackay Reservoir	Rainbow	.186
Snake River (South Fork)	Sucker	.090
Snake River (Henry's Fork)	Sucker	.002
Snake River (Idaho Falls)	Sucker	.175
American Falls Reservoir	Sucker	.558
Jordan Creek	Sucker	.520
Antelope Reservoir (Oregon)	Sucker	.742
Jordan Creek	Rainbow	.231
Antelope Reservoir (Oregon)	Rainbow	.910

TABLE 117
MERCURY RESIDUES IN IDAHO HATCHERY FISH, 1970-1971

Fish Hatchery	Species	Sample No.	Average - Hg ppm
*American Falls	Rainbow	5	.118
*Ashton	Rainbow	6	.092
Dworshak National	Steelhead (Smolts)	10	.015
Eagle	Rainbow	10	Neg.**
Hagerman (State)	Rainbow	10	.106
Mackay	Rainbow	10	.186
Niagara Springs	Steelhead (Smolts)	10	.095
Rapid River	Chinook Smolts	10	.116
	*Chinook Adults	5	.110

*Sampled in 1970
**Less than 0.002 ppm

TABLE 118
MERCURY RESIDUES IN DRY FISH FEED (IDAHO FISH AND GAME FORMULA), 1971

Ingredient	Percent in Formula (Wt.)	Hg - ppm
Composite Sample		.060
Canadian Herring Meal (Sample #1)	31	.170
Canadian Herring Meal (Sample #2)		.165
Canadian Herring Meal (Sample #3)		.063
Canadian Herring Meal (Sample #4)		.102
Fish Oil	2	.020
Blood Meal (Sample #1)	5	.005
Blood Meal (Sample #2)		.004
Meat Scrap Meal	10	.038
Delactosed Whey	8	.008
Soybean Flour Meal	10	.005
Kelp Meal	3	.018
Wheat Middlings	19	.002

Southfork Coeur d'Alene River. Cadmium was present in significant amounts in Canyon Creek below the Star Mine, Nine Mile Creek below the Rex and Day Rock Mines, Government Gulch, and the lower part of the South Fork. The Spokane River at stateline contained essentially no lead or cadmium on the five sampling dates.

In the Coeur d'Alene Lake the only heavy metal found consistently was zinc.

Table 119 displays the lead and cadmium values found in 1970 and 1971 of this study. As can be seen from the table, lead and cadmium values are significantly lower in Coeur d'Alene Lake than in the river system of the same name.

TABLE 119

HEAVY METALS CONCENTRATIONS

Coeur d'Alene River System
ppm

	NO. OF SAMPLES	RANGE	MEAN	STANDARD DEVIATION
LEAD 1970	62	<0.01 -8.78	0.551	1.55
LEAD 1971	46	<0.01 -9.08	0.705	2.04
CADMIUM 1970	62	<0.001-2.96	0.1634	0.5519
CADMIUM 1971	47	<0.001-3.59	0.3017	0.8334

Coeur d'Alene Lake System
ppm

	NO. OF SAMPLES	RANGE	MEAN	STANDARD DEVIATION
LEAD 1970	59	<0.01 -0.07	0.012	0.0091
LEAD 1971	14	<0.01 -<0.01	<0.01	0.00
CADMIUM 1970	59	<0.001-<1.00	0.0218	0.1296
CADMIUM 1971	14	<0.001-<0.001	<0.001	0.00

7.0 OREGON AGENCY DATA ANALYSIS

7.1 Oregon State Department of Agriculture

A voluminous package of assorted toxic substance information was received from the above-mentioned agency. This package contained various toxic substance items from different agencies within the state of Oregon, since the Department of Agriculture laboratory performs analysis for the same. The package was separated into two time periods: prior to and including 1970, and post 1970. The 1970 group included roughly thirty pieces of information while the 1971 group contained approximately 40 pieces.

This data is not being analyzed by MITRE since it was received after the data analysis cut-off point in the project schedule. However, this data will be available at EPA for inspection by interested agencies. Table 120 displays the types of literature contained in each group of data.

TABLE 120

OREGON STATE DEPARTMENT OF AGRICULTURE
TOXIC SUBSTANCE SUBJECT MATTER

1970

- Conference reviews
- Lab analysis results
- Mercury in milk
- Pesticides in fish and food
- Mercury in rivers
- Industrial mercury release
- Solid waste
- Interoffice communication
- Episodal monitoring reports
- News releases and letters
- Mercury in fish, pheasants, various birds and shellfish
- Mercury in grains
- Magazine articles

1971

- Abstracts of Mercury Research, "Mercury in the Western Environment"
- Analysis methods for gas chromatograph, A.A., digestion, etc.
- Mercurial pesticides
- Milk studies
- Symposium reviews
- Methods of mercury determination
- Mercury treated seed
- Methyl mercury in marine products
- Mercury in fish and pheasants
- Mercury in Barnett chickens
- Mercury in food products
- Mercury and pesticide in fish
- Mercury and PCB's in eggs
- Aflatoxins in imported wine
- Analysis list of industrial products
- Lead in pottery
- Lead in evaporated milk
- Lead poisoning
- Mercury, lead, cadmium, and arsenic residues in starlings

7.2 Oregon Environmental Quality Commission

Ambient lead data obtained in a special study of lead levels in three selected locations collected in the Terwilliger area survey in 1973 and 1974 for the purpose of instituting an ambient lead air quality standard for the state of Oregon was received. The data was tabulated and is presented in Table 121 . The standard proposed as a result of this study is as follows: "The lead concentration measured at any individual sampling station, using sampling and analytical methods on file with the department, shall not exceed 3.0 $\mu g/m^3$ as an arithmetic average concentration of all samples collected at that station during any one calendar month period"*. As can be seen from the yearly averages, the three selected sites are safely within the limits of the standard.

Three-month average ambient air lead concentration data was also received for statewide and Portland area stations (approximately 40 stations) for the years 1971-1973. This data is given in the form of minimum and maximum three-month averages, although the months used are not specified. This data will be kept on file at EPA until further analysis is warranted necessary.

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*Memorandum from the Director of Environmental Quality Commission to the Commission, January 10, 1975.

TABLE 121

OREGON-TERWILLIGER AREA LEAD STUDY

μg/m^3

LOCATION	# OF SAMPLES	MINIMUM	MAXIMUM	MEAN	STANDARD DEVIATION
1973					
Kneeland and Kneeland	29	0.37	5.72	1.67	1.01
Terwilliger School	24	0.24	3.57	1.26	0.83
View Point Terrace	26	0.32	4.88	2.09	1.13
1974					
Kneeland and Kneeland	5	0.55	2.05	1.05	0.59
Terwilliger School	5	0.16	1.87	0.67	0.68
View Point Terrace	4	0.78	1.95	1.37	0.83

8.0 IOWA AGENCY DATA ANALYSIS

8.1 Iowa Department of Agriculture - Pesticide Residue Division

Pesticide residue forms with analyses for PCB's were received. There were essentially two groups of data in this package.

The first group of ten reports dealt with pesticide residues in fish meal in 1975. The values shown in Table 122 were derived by combining three different PCB mixtures--AROCLOR 1242, 1248, and 1254.

The second group of 20 sheets dealt with pesticide residues in three different types of fish: carp (12), buffalo fish (7), and channel catfish (1) for the year 1972. The specific PCB mixture identified was AROCLOR 1254. A summary of values is shown in Table 122.

According to the Department of Agriculture, the "action" limit for PCB compounds is 2.0 ppm. As can be seen from the mean values in Table 122, the PCB residues are sufficiently high to generate some investigation of PCB contamination. Up to the time of the meeting in Iowa, the source of PCB's had not been determined. However, one explanation was that the source of contamination resulted from the use of rough fish like the carp in the preparation of the fishmeal. These fish might contain minute amounts which become magnified by the manufacture of the fishmeal through the process of concentrating the PCB content of different species of fish.

TABLE 122

IOWA DEPARTMENT OF AGRICULTURE - PCB DATA SUMMARY

1975 - FISH MEAL

PCB's - AROCLOR 1242, 1248, 1254

ppm

NO. OF SAMPLES	MINIMUM	MAXIMUM	MEAN	STANDARD DEVIATION
10	.354	6.16	2.21	1.61

1972 - FISH (CARP, BUFFALO, CHANNEL CATFISH) AROCLOR 1254

ppm

NO. OF SAMPLES	MINIMUM	MAXIMUM	MEAN	STANDARD DEVIATION
20	.18	10.26	2.15	2.34

8.2 Iowa Department of Environmental Quality

Analysis sheets on raw and finished drinking water supplies for the period 1971-1975 were received. This group of data was grouped together statistically since the individual data sheets were not identified by year. Data on arsenic, cadmium, and lead was analyzed statistically, with the results being shown in Table 123. The means of all the finished water data for the three constituents were within acceptable standards for the state of Iowa. The standards are shown below.

STANDARDS

Arsenic - *.01 mg/l

Cadmium - .01 mg/l

Lead - .05 mg/l

Drinking water values seem fairly consistent and do not appear to be a problem in Iowa.

---

*Proposed Standard.

TABLE 123

IOWA RAW AND FINISHED DRINKING WATER

1971 - 1975

mg/1

	NO. SAMPLES	MINIMUM	MAXIMUM	MEAN	STANDARD DEVIATION
Arsenic					
Raw	22	.01	.063	.03	.086
Finished	5	.01	.01	.01	-
Cadmium					
Raw	2	.01	.02	.015	-
Finished	1	.01	.01	.01	
Lead					
Raw	99	.01	.23	.031	.031
Finished	29	.01	.08	.02	.015

8.3 The University of Iowa, State Hygienic Laboratory

The State Hygienic Laboratory sent MITRE copies of data obtained by sampling in the vicinity of the DeMoss dump in January of 1975. The analysis sheets included Cr and Pb data for samples of dirt and dump barrel particles, and sand bottom and clay-mud bottom water samples. The values obtained are shown in Table 124. All the Cr and Pb data received is shown in tabular form. The values of significance were the high values for Pb and Cr in the dump barrel samples. The material sampled appeared to be a mixture of absorbent particles, with traces of green paint or grease.

TABLE 124

WATER QUALITY REPORT DATA

DeMOSS DUMP, IOWA

ppm

TRACE METALS	DIRT AROUND BARREL	FROM DUMP BARREL	FROM DUMP BARREL	FROM DUMP BARREL	SANDBOTTOM DOWNSTREAM OF DUMP
Cr	4.5	8000.0	15,000.0	2.0	0.01
Pb	27.0	43,000	81,000.0	12	0.01

TRACE METALS	SANDBOTTOM DOWNSTREAM OF DUMP	CLAY, MUD BOTTOM IMPOUDED WATER	CLAY, MUD BOTTOM IMPOUNDED WATER	SANDBOTTOM UPSTREAM OF DUMP	SANDBOTTOM UPSTREAM OF PUMP
Cr	2.3	0.01	25	0.01	2.3
Pb		0.01	35	0.01	1.2

9.0 CALIFORNIA AGENCY DATA ANALYSIS

9.1 California Air Resources Board

Daily high volume sampling data from the California Air Resources Board was received. Lead data was received for the years 1971-1974 and cadmium data was received for the years 1972-1974. The data was coded on SAROAD daily data forms and analyzed for the usual parameters:

- Minimum
- Maximum
- Mean
- Standard Deviation

Approximately fifty of the SAROAD site numbers that appear with the California air data are not official. The reason for this is the failure to locate SAROAD numbers for these sites through the usual reference* or the California Agency itself. It appears that some of the sites were used only for a special lead study program. A key to the fabricated** site numbers with their respective locations appears as Table 125. The data itself in analyzed form appears in Appendix A of Volume IV of the Final Report, Compilation of the Summaries and Analyses of State Data.

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*Directory of Air Quality Monitoring Stations-USEPA.

**Site numbers fabricated by MITRE for purposes of computer processing.

TABLE 125

UNIDENTIFIED CALIFORNIA SITES

051111111	ARCATA FIRE STATION
051111112	SAMOA
051111113	RIALTO AIRPORT
051111114	FONTANA CYPRESS
051111115	CRESTLINE
051111116	CHINO RIVERSIDE
051111117	PASADENA WALNUT
051111118	BIG BEAR CITY, MOONRIDGE
051111119	MISSION VALLEY
051111110	MADERA H.D.
051111121	NEEDLES, H.S.
051111122	LUCERNE VALLEY
051111124	RED BLUFF AG COMM OFF
051111125	YREKA
051111126	TULELAKE
051111127	ALTURAS
051111128	TRAILER WATSONVILLE
051111129	BISHOP
051111130	LONE PINE AIRPORT
051111131	LEE VINING
051111132	MARIPOSA
051111134	CAMINO
051111135	PLACERVILLE
051111136	MADERA LIBRARY
051111137	BRIDGEPORT CO. MAINT. YD.
051111138	HANFORD H.D.
051111139	CORCORAN FIRE STATION
051111140	COLUMBIA
051111141	NORD
051111142	CAMINO
051111143	HOLLISTER
051111144	LAKEPORT
051111145	SANTA ROSA, HUMBOLDT
051111147	FORT BRAGG, FIRESTONE
051111148	FORT BRAGG, CENTRAL
051111149	SANTA MARIA, WTR & STOR.
051111150	EL CENTRO, BROADWAY
051111151	SONORA
051111153	FORT BRAGG, SO. MAIN
051111154	SKY FOREST
051111155	MERCED TRAILER
051111156	RIVERSIDE RUBIDOUX
051111157	COSTA MESA HARBOR
051111158	EL TORO
051111159	LAGUNA BEACH, BROADWAY
051111160	RIVERSIDE MAGNOLIA
051111161	MANZANITA

9.2 State of California, Department of Water Resources

MITRE contracted with the above-mentioned agency to produce a computer listing of all toxic substance information that would be of value to the project. The final computer printout received consisted of 8-1/2 x 11" copies of the data in statistically analyzed form for the parameters arsenic, cadmium, chromium, hexavalent chromium, lead, and mercury for the years 1971 through 1974.

The data listing contains 1,150 analyses for 328 stations on 171 streams, lakes, bays, canals, drains, etc., and 733 analyses from 650 wells in 48 groundwater basins or areas. The statistical analyses are arranged by parameter and then by year, and finally for the four-year period 1971-74 for that parameter.

10.0 TEXAS AGENCY DATA ANALYSIS

10.1 Texas State Department of Health, Air Pollution Control Services

The state of Texas performs extensive trace metal analyses on Hi-Vol filters sent in for analysis from the states 60 sampling stations, along with filters sent in from local programs with some metal analysis of their own, such as Dallas. None of this heavy metal air data is in the SAROAD system, but is currently in the Texas state air data bank. Texas provided all pertinent air data on As, Cd, Cr, and Pb for the years 1973 and 1974 on magnetic tape in SAROAD format.

The bulk of the air data has been analyzed by one of the most up-to-date techniques, X-ray fluorescence, although some of the lead data was analyzed by atomic absorption. The air data was analyzed with a statistical program, the results of which are shown in Appendix A of Volume IV of the Final Report, Compilation of the Summaries and Analyses of State Data.

10.2 El Paso City-County Health Department

Because a large volume of data on lead, zinc, arsenic, and cadmium in air, dust, soil and blood was received from the El Paso City-County Health Department near the end of the project, it was not possible to process and analyze all the data in the time remaining. The dust and soil data and the air sampling data has been processed and summarized by sampling location, year, and toxic substances. The remaining data is available for further analysis and has been turned over to OTS with all other data received from agencies in the states in the course of the project.

10.2.1 El Paso Ambient Air Data

Ambient air data for the years 1972 through 1975 for 13 locations in Smeltertown an area of El Paso adjacent to the ASARCO smelter was received. The heavy metals that were monitored for in this study were arsenic, cadmium, lead, and zinc.

The sampling procedures were performed jointly at each sampling site by ASARCO and El Paso City-County Health Department sampling teams. Each team served as a check on the other since the data obtained from the sampling was to be presented later in a court case involving ASARCO's compliance with Texas State Air Emission Standards. The air data in statistically analyzed form is presented in Appendix A of Volume IV of Final Report No. M75-52, Summary and Analysis of State Toxic Substances Data. Table 126 displays the Hi-Vol sampling site locations with their respective code numbers.

TABLE 126

SITE IDENTIFICATION CODES - EL PASO AIR DATA*

000000001	2473 Veterans of Foreign Wars
900000001	2473 Veterans of Foreign Wars
000000002	International Boundary and Water Commission
900000002	International Boundary and Water Commission
000000003	Tillman Health Center, 222 South Campbell
900000003	Tillman Health Center, 222 South Campbell
000000004	Kern-Fire Station #8, 301 East Robinson
900000004	Kern-Fire Station #8, 301 East Robinson
000000005	Executive Center-Koger Bldg, 4120 Rio Bravo
900000005	Executive Center-Koger Bldg, 4120 Rio Bravo
000000006	Highland-Highland School, 2300 San Diego
900000006	Highland-Highland School, 2300 San Diego
000000007	Rudolph-Rudolph Chevrolet, 3003 North Mesa
900000007	Rudolph-Rudolph Chevrolet, 3003 North Mesa
000000008	Holy Family-Holy Family Church, 900 West Missouri
900000008	Holy Family-Holy Family Church, 900 West Missouri
000000009	Buena Vista-Buena Vista Clinic, 120 Courchesne
900000009	Buena Vista-Buena Vista Clinic, 120 Courchesne
000000010	4201 Emory Road - Dr. Scruggs, 4201 Emory Road
900000010	4201 Emory Road - Dr. Scruggs, 4201 Emory Road
900000011	International Boundary and Water Commission - B
900000012	117 Carlos Lopez
900000013	E. B. Jones

---

*Leading 0 in a site number = ASARCO analysis
Leading 9 in a site number = El Paso City County Health Analysis

10.2.2 El Paso Soil & Dust Data

The El Paso City County Health Department sampling team also worked in tandem with the ASARCO sampling team in analyzing soil and dust data obtained in a study run in parallel with the Smeltertown ambient air data study. This data was also used in the court case concerning ASARCO's compliance with Texas air quality standards.

MITRE received soil and dust data for arsenic, cadmium, lead, and zinc for the years 1972 through 1975. The data was analyzed by computer in terms of parameter, year, method, units, and site location for the usual statistical parameters.

The data in analyzed form appears in Appendix A of Volume IV of Final Report, Compilation of the Summaries and Analyses of State Data.

Soil and dust analyzed by each different agency are keyed by the first number in each site description at the far left hand side of the page. The scheme is as follows:

- Leading 1 = El Paso Soil Analysis
- Leading 2 = ASARCO Soil Analysis
- Leading 3 = El Paso Dust Analysis
- Leading 4 = ASARCO Dust Analysis

For example, the first location listed for arsenic in 1972 is 1 Alamo. The number 1 indicates that this line of data is soil data sampled at Alamo and analyzed by the El Paso City-County Health

Department. The nine characters (columns 2-10) following the 1,2,3 and 4 designators were used to print out the location of the site in as many letters that could possibly fit in that particular location field size.

APPENDIX A

SUMMARY OF TOXIC SUBSTANCES DATA

PROCESSED BY COMPUTER

INTRODUCTION

During the course of the Toxic Substances Project, a large portion of data was analyzed by computer methods. The majority of this data was air data provided by several different air agencies. One portion of the data was soil and dust data from the El Paso City-County Health Department.

The program that was used for processing of Hi-Vol air data basically followed the guidelines presented in EPA's SAROAD users manual for computer processing of data values. MITRE's method of operation was to take the raw air data from the contributing agencies, code it on standard SAROAD forms, keypunch it, and analyze it statistically by computer.

The purpose of this processing was twofold:

- To provide analysis of the toxic substance air data to OTS
- To arrange the data in SAROAD format for entry into the NADB.

The output of this program was a presentation of the data of interest in a concise, simple format. The final data printouts report the data by the following parameters:

- Toxic substance
- Method
- Units
- Year

- Site
- Number of samples

The results yielded by the analysis program include the following:

- Average
- Minimum
- Maximum
- Standard deviation

The soil and dust data that was received from El Paso City-County Health Department was also processed with the air data program, with some modifications in the variable portions of the program. Since this program was basically a statistical package, it was possible to modify it to process other types of toxic substance data. The following pages of this appendix list the program used to process the SAROAD air data, and the air data summary printout sheets for all agencies. Also included is the data summary of the El Paso soil and dust study.

SAROAD DATA STATISTICAL

ANALYSIS PROGRAM

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SAROAD DATA STATISTICAL ANALYSIS PROGRAM

```
        S2RPT:PROCEDURE OPTIONS(MAIN) ;


STMT LEVEL NEST
  1                   S2RPT:PROCEDURE OPTIONS(MAIN) ;
                      /*
                           SUMMARY REPORT FOR SAROAD TYPE 2 CARDS
                      */
  2     1                  DCL 1 IN UNALIGNED BASED(P) ,
                                2 CD CHAR(1)  ,
                                2 LOC CHAR(9) ,
                                2 AGENCY CHAR(1)   ,
                                2 PROJ   CHAR(2)   ,
                                2 TIME   CHAR(1)   ,
                                2 YR     CHAR(2)   ,
                                2 MONTH  CHAR(2)   ,
                                2 DAY    CHAR(2)   ,
                                2 HOUR   CHAR(2)   ,
                                2 OBS(4)           ,
                                 3 CODE  CHAR(9)   ,
                                 3 DP    CHAR(1)   ,
                                 3 SAMPLE CHAR(4)  ,
                                2 DUMMY  CHAR(2)   ;
  3     1                  DCL 1 IN2 UNALIGNED BASED(P) ,
                                2 P1 CHAR(18) ,
                                2 P2 CHAR(60) ,
                                2 P3 CHAR(2) ;
  4     1                  DCL 1 OLD                ,
                                2 CODE CHAR(9) ,
                                2 YR CHAR(2)   ;
  5     1                  DCL 1 UNIQUE                      ,
                                2 LOC(120) CHAR(9)           ,
                                2 NLOC   FIXED BIN(31)       ,
                                2 YR( 5) CHAR(2)             ,
                                2 NYR    FIXED BIN(31)       ,
                                2 CODE(30) CHAR(9)           ,
                                2 NCODE FIXED BIN(31)        ;
  6     1                  DCL 1 STAT(120, 5,30)             ,
                                2 NUM     FIXED BIN(31) ,
                                2 MINS    FLOAT DEC( 6) ,
                                2 MAXS    FLOAT DEC( 6) ,
                                2 SUM     FLOAT DEC(06) ,
                                2 SUMSQ   FLOAT DEC(13) ;
  7     1                  DCL SCALE(5,30) FIXED BIN(15) INITIAL((100)0) ;
  8     1                  DCL DATA    FLOAT DEC(13)    ;
  9     1                  DCL INREC FIXED BIN(31) INITIAL(0) ;
                      /* */
 10     1                  STAT.NUM(*,*,*) = 0 ;
 11     1                  STAT.SUM(*,*,*),STAT.SUMSQ(*,*,*) = 0.0E+0 ;
 12     1                  STAT.MINS(*,*,*)=      999999. ;
 13     1                  STAT.MAXS(*,*,*)=     -999999. ;
 14     1                  DCL PCODE(4) CHAR(5) INITIAL
                         ('12103',
                          '12105',
                          '12110',
                          '12128');
        S2RPT:PROCEDURE OPTIONS(MAIN) ;


STMT LEVEL NEST

 15      1                 DCL PWORD(4) CHAR(10) INITIAL
                          ('ARSENIC    ' ,
                           'BERYLLIUM ' ,
                           'CADMIUM    ' ,
                           'LEAD       ' );
 16      1                 DCL NP FIXED BIN(31) INITIAL(4) ;
 17      1                 DCL PC CHAR(5) ;
 18      1                 DCL PW CHAR(10) ;
 19      1                 DCL MCODE(1) CHAR(2) INITIAL
                          ('92');
 20      1                 DCL MWORD(1) CHAR(18) INITIAL
                          ('ATOMIC ABSORPTION ') ;
 21      1                 DCL NM FIXED BIN(31)INITIAL(1) ;
 22      1                 DCL MC CHAR(2);
 23      1                 DCL MW CHAR(18);
 24      1                 DCL UCODE(2) CHAR(2) INITIAL
                          ('01',
                           '03');
 25      1                 DCL UWORD(2) CHAR(23) INITIAL
                          ('MICROGRAMS/CUBIC METER ',
                           'NANOGRAMS/CUBIC METER  ');
 26      1                 DCL NU FIXED BIN(31) INITIAL(2) ;
 27      1                 DCL UC CHAR(2) ;
 28      1                 DCL UW CHAR(23) ;
 29      1                 DCL OPT CHAR(1) ;
 30      1                 OPEN FILE(SYSPRINT) PAGESIZE(60) LINESIZE(132) ;
 31      1                 UNIQUE.NLOC,UNIQUE.NYR,UNIQUE.NCODE = 0 ;
 32      1                 ON ENDFILE(SYSIN) GO TO REPORT ;
                      /*
                           OPTION (COL.1 OF FIRST CARD)
                             1 = SKIP CARDS WHOSE CODES ARE NOT IN PROGRAM TABLES
                      */
 34      1                 READ FILE(SYSIN) SET(P) ; OPT = IN.CD ;
                      /* */
 36      1              RD:READ FILE(SYSIN) SET(P) ;  INREC = INREC + 1 ;
 38      1                 IF VERIFY(IN2.P2,' 0123456789')  ¬= 0 THEN DO ;
 40      1    1               PUT EDIT('** INVALID CHARACTER **') (COL(1),A) ;
 41      1    1               GO TO ERR ;
 42      1    1            END ;
 43      1                 IF VERIFY(IN.LOC,'0123456789') ¬= 0 THEN DO ;
 45      1    1                                      PUT EDIT('** LOCATION FIELD ERROR (COLS 2-
                      10) **')  (COL(1),A) ;
 46      1    1                                 ERR: PUT EDIT( IN,     '      RECORD NUMBER',
                                                            INREC) (COL(1),22 A,A,F(7)) ;
 47      1    1                                      GO TO RD;
 48      1    1                                      END;
 49      1                 IF VERIFY(IN.YR,'0123456789') ¬= 0 THEN DO ;
 51      1    1                                      PUT EDIT('** YEAR FIELD ERROR (COLS 15-16)
                       **')  (COL(1),A) ;
 52      1    1                                      GO TO ERR;
 53      1    1                                      END;
```

```
        S2RPT:PROCEDURE OPTIONS(MAIN) ;

STMT LEVEL NEST

 54      1              DO I = 1 TO 4 ;
 55      1     1        IF IN.OBS(I).CODE ¬= (9)' ' THEN
 56      1     1        IF VERIFY(IN.OBS(I).CODE,'0123456789') ¬= 0
 57      1     1           | SUBSTR(IN.OBS(I).CODE,1,2) <= 0 THEN DO ;
 58      1     2                    PUT EDIT('** CODE FIELD ERROR (COLS',23+14*(I-1),'-',
                                          31+14*(I-1),') **')
                                        (COL(1),A,F(3),A,F(2),A) ;
 59      1     2                    GO TO ERR;
 60      1     2                    END ;
 61      1     1        END;
 62      1              IF OPT = '1' THEN DO;
 64      1     1           DO I = 1 TO 4;
 65      1     2           PC = SUBSTR(IN.OBS(I).CODE,1,5) ;
 66      1     2           MC = SUBSTR(IN.OBS(I).CODE,6,2) ;
 67      1     2           UC = SUBSTR(IN.OBS(I).CODE,8,2) ;
 68      1     2             DO J = 1 TO NP;
 69      1     3             IF PC = PCODE(J) THEN GO TO Z1;
 71      1     3             END;
 72      1     2             GO TO Z3;
 73      1     2          Z1:DO J = 1 TO NM;
 74      1     3             IF MC = MCODE(J) THEN GO TO Z2;
 76      1     3             END;
 77      1     2             GO TO Z3;
 78      1     2          Z2:DO J = 1 TO NU;
 79      1     3             IF UC = UCODE(J) THEN GO TO Z4;
 81      1     3             END;
 82      1     2       Z3: END;
 83      1     1          GO TO RD;
 84      1     1                         END;
 85      1           Z4:DO I = 1 TO UNIQUE.NLOC ;
 86      1     1        IF UNIQUE.LOC(I) = IN.LOC THEN GO TO A1;
 88      1     1        END;
 89      1              UNIQUE.NLOC = UNIQUE.NLOC + 1 ;
 90      1              IF UNIQUE.NLOC > 120 THEN DO;
 92      1     1           PUT EDIT ('TOO MANY LOCATIONS') (SKIP(2),A);
 93      1     1           STOP;
 94      1     1           END;
 95      1              UNIQUE.LOC(I) = IN.LOC ;
 96      1          A1:
                        DO J = 1 TO UNIQUE.NYR ;
 97      1     1        IF UNIQUE.YR(J) = IN.YR THEN GO TO A2;
 99      1     1        END;
100      1              UNIQUE.NYR = UNIQUE.NYR + 1 ;
101      1              IF UNIQUE.NYR > 5 THEN DO;
103      1     1           PUT EDIT ('TOO MANY YEARS') (SKIP(2),A);
104      1     1           STOP;
105      1     1           END;
106      1              UNIQUE.YR(J) = IN.YR ;
107      1          A2:
                        DO L = 1 TO 4 ;
108      1     1        IF IN.OBS(L).CODE = (9)' ' THEN GO TO A4 ;
```

```
      S2RPT:PROCEDURE OPTIONS(MAIN) ;

 STMT LEVEL NEST

 110     1     1          IF IN.OBS(L).SAMPLE = (4)' '  THEN GO TO A4;
 112     1     1          IF IN.OBS(L).SAMPLE = (4)'9'  THEN GO TO A4;
 114     1     1             DO K = 1 TO UNIQUE.NCODE ;
 115     1     2             IF UNIQUE.CODE(K) = IN.OBS(L).CODE THEN GO TO A3;
 117     1     2             END;
 118     1     1             UNIQUE.NCODE = UNIQUE.NCODE + 1 ;
 119     1     1          IF UNIQUE.NCODE > 30 THEN DO;
 121     1     2             PUT EDIT ('TOO MANY PARAMETER CODES') (SKIP(2),A);
 122     1     2             STOP;
 123     1     2             END;
 124     1     1             UNIQUE.CODE(K) = IN.OBS(L).CODE ;
 125     1     1     A3:
 126     1     1          IF IN.OBS(L).DP = ' ' THEN DATA = IN.OBS(L).SAMPLE ;
 127     1     1                                 ELSE DO; DATA = IN.OBS(L).SAMPLE *
                                                        10.E+0 **(-IN.OBS(L).DP) ;
 129     1     2                                           SCALE(J,K) = MAX(SCALE(J,K),
                                                                         IN.OBS(L).DP) ;
 130     1     2                                       END ;
 131     1     1          STAT(I,J,K).NUM = STAT(I,J,K).NUM + 1 ;
 132     1     1          STAT(I,J,K).SUM = STAT(I,J,K).SUM + DATA ;
 133     1     1          STAT(I,J,K).SUMSQ = STAT(I,J,K).SUMSQ + DATA*DATA ;
 134     1     1          STAT(I,J,K).MINS = MIN (STAT(I,J,K).MINS ,DATA) ;
 135     1     1          STAT(I,J,K).MAXS = MAX (STAT(I,J,K).MAXS ,DATA) ;
 136     1     1     A4:
                          END;
 137     1                GO TO RD;
 138     1           REPORT:
                          DO I = 1 TO NLOC ;
 139     1     1          DO J = 1 TO NYR ;
 140     1     2          DO K = 1 TO NCODE ;
 141     1     3          IF STAT(I,J,K).NUM <= 0 THEN GO TO SKP;
 143     1     3          IF STAT(I,J,K).NUM > 1  THEN
 144     1     3          STAT(I,J,K).SUMSQ  = SQRT( (STAT(I,J,K).SUMSQ -
                                                      STAT(I,J,K).SUM * STAT(I,J,K).SUM /
                                                      STAT(I,J,K).NUM ) /
                                                     (STAT(I,J,K).NUM - 1.E+0) ) ;
 145     1     3          STAT(I,J,K).SUM = STAT(I,J,K).SUM / STAT(I,J,K).NUM ;
 146     1     3     SKP: END;
 147     1     2          END;
 148     1     1          END;
 149     1                ON ENDPAGE(SYSPRINT) BEGIN;
 151     2                 PUT PAGE EDIT('PARAMETER: ',PW                    ,'METHOD: ',
                            MW                   ,'UNITS: ',UW                 ,
                            'YEAR: 19',OLD.YR, 'NUMBER OF','STANDARD','SITE',
                            '   SAMPLES    AVERAGE    MINIMUM    MAXIMUM DEVIATION','          ')
                                      (COL(16),A,A,SKIP(2),COL(19),A,
                            A,SKIP    ,COL(20),A ,A ,SKIP(2),COL(21),
                            A ,A, SKIP(3),COL(12),A, COL(53),A,SKIP,COL(3),A,COL(11),A) ;
 152     2                 END;
 153     1                DO K = 1 TO NCODE ;
 154     1     1          OLD.CODE = UNIQUE.CODE(K) ;
```

```
          S2RPT:PROCEDURE OPTIONS(MAIN) ;


 STMT LEVEL NEST

 155     1     1          PC = SUBSTR(OLD.CODE,1,5) ;
 156     1     1          DO I = 1 TO NP;
 157     1     2          IF PC = PCODE(I) THEN DO;
 159     1     3                                PW = PWORD(I) ;
 160     1     3                                GO TO X1;
 161     1     3                                END;
 162     1     2          END ;
 163     1     1          IF OPT = '1' THEN GO TO SKP3;
 165     1     1          PW = PC ;
 166     1     1       X1:MC = SUBSTR(OLD.CODE,6,2) ;
 167     1     1          DO I = 1 TO NM;
 168     1     2          IF MC = MCODE(I) THEN DO;
 170     1     3                                MW = MWORD(I) ;
 171     1     3                                GO TO X2 ;
 172     1     3                                END;
 173     1     2          END;
 174     1     1          IF OPT = '1' THEN GO TO SKP3;
 176     1     1          MW = MC;
 177     1     1       X2:UC = SUBSTR(OLD.CODE,8,2) ;
 178     1     1          DO I = 1 TO NU ;
 179     1     2          IF UC = UCODE(I) THEN DO;
 181     1     3                                UW = UWORD(I) ;
 182     1     3                                GO TO X3;
 183     1     3                                END;
 184     1     2          END ;
 185     1     1          IF OPT = '1' THEN GO TO SKP3 ;
 187     1     1          UW = UC ;
 188     1     1      X3:
                          DO J = 1 TO NYR ;
 189     1     2          OLD.YR    = UNIQUE.YR(J) ;
 190     1     2          FLAG = 1 ;
 191     1     2          L = SCALE(J,K) ;
 192     1     2          DO I = 1 TO NLOC;
 193     1     3          IF STAT(I,J,K).NUM <= 0 THEN GO TO SKP2;
 195     1     3          IF FLAG = 1 THEN SIGNAL ENDPAGE(SYSPRINT) ;
 197     1     3          PUT EDIT( UNIQUE.LOC(I),STAT(I,J,K).NUM,STAT(I,J,K).SUM,
                                    STAT(I,J,K).MINS,STAT(I,J,K).MAXS)
                                  ( COL(1),A,COL(11),F(10), 3 F(10,L) ) ;
 198     1     3          IF STAT(I,J,K).NUM > 1 THEN
 199     1     3            PUT EDIT(STAT(I,J,K).SUMSQ) (F(10,L)) ;
 200     1     3          FLAG = 0 ;
 201     1     3     SKP2:END;
 202     1     2          END;
 203     1     1     SKP3:END;
 204     1           END S2RPT;
```

PENNSYLVANIA BUREAU OF AIR QUALITY

SAROAD DAILY DATA

PARAMETER: CADMIUM

METHOD: ATOMIC ABSORPTION
UNITS: MICROGRAMS/CUBIC METER

YEAR: 1971

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
399400321	23	0.003	0.002	0.005	0.001
399560322	23	0.003	0.002	0.010	0.002
399570323	23	0.003	0.002	0.006	0.001
399570324	23	0.003	0.002	0.006	0.001
399400325	24	0.002	0.002	0.005	0.001
399570326	23	0.005	0.001	0.040	0.008
393060601	36	0.004	0.002	0.046	0.007
393060602	48	0.003	0.002	0.025	0.003
393060604	36	0.002	0.002	0.005	0.001
393080605	39	0.002	0.002	0.005	0.001
393060603	36	0.002	0.002	0.004	0.001
390720711	67	0.003	0.002	0.013	0.002
397620712	70	0.003	0.002	0.014	0.002
398240713	69	0.004	0.002	0.043	0.005
398270714	69	0.004	0.002	0.031	0.004
397620715	69	0.004	0.002	0.012	0.002
390720716	69	0.004	0.002	0.030	0.004
394820717	69	0.004	0.002	0.032	0.005
395700301	66	0.003	0.002	0.006	0.002
392340302	62	0.003	0.002	0.006	0.002
396640303	60	0.002	0.002	0.012	0.001
394980304	68	0.003	0.002	0.006	0.001
392340305	63	0.003	0.002	0.013	0.002
393880306	66	0.003	0.002	0.008	0.002
392180307	58	0.003	0.002	0.006	0.001
396440501	39	0.003	0.002	0.015	0.002
394840502	39	0.003	0.002	0.010	0.002
390560503	18	0.004	0.002	0.021	0.005
390580504	17	0.011	0.002	0.080	0.019
390560505	39	0.018	0.002	0.170	0.036
397800506	17	0.019	0.002	0.051	0.018
390180507	17	0.011	0.001	0.048	0.014
390440508	17	0.041	0.002	0.385	0.091
395740509	17	0.015	0.002	0.038	0.013
390560510	17	0.005	0.002	0.027	0.006
399430201	57	0.003	0.002	0.018	0.004
392400202	57	0.003	0.002	0.009	0.002
394410203	56	0.003	0.002	0.019	0.003
397280204	57	0.003	0.002	0.014	0.002
399520205	56	0.004	0.002	0.023	0.004
396300206	57	0.002	0.002	0.002	0.000
399430207	57	0.003	0.002	0.020	0.004
398040208	57	0.003	0.002	0.012	0.002
395220209	57	0.003	0.002	0.020	0.004
395220210	28	0.002	0.002	0.008	0.002
399200511	17	0.005	0.002	0.020	0.005
395920512	17	0.010	0.002	0.070	0.017
399200513	17	0.003	0.002	0.011	0.002
399200514	17	0.003	0.002	0.008	0.002

PARAMETER: CADMIUM

METHOD: ATOMIC ABSORPTION
UNITS: MICROGRAMS/CUBIC METER

YEAR: 1971

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
399200515	17	0.003	0.002	0.011	0.002
399330516	17	0.004	0.002	0.015	0.004
394700311	45	0.003	0.002	0.019	0.003
394660312	45	0.003	0.002	0.012	0.002
394700313	45	0.003	0.002	0.029	0.004
394660314	48	0.006	0.002	0.030	0.007
394660315	49	0.004	0.002	0.020	0.005
394700317	49	0.003	0.002	0.009	0.001
394700316	32	0.004	0.002	0.012	0.002
394706316	5	0.002	0.002	0.002	0.000

PARAMETER: CADMIUM

METHOD: ATOMIC ABSORPTION
UNITS: MICROGRAMS/CUBIC METER

YEAR: 1972

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
399400321	15	0.002	0.002	0.002	0.000
399560322	12	0.002	0.002	0.002	0.000
399570323	12	0.002	0.002	0.002	0.000
399570324	14	0.002	0.002	0.002	0.000
399400325	12	0.002	0.002	0.002	0.000
399570326	14	0.002	0.002	0.006	0.001
390120701	12	0.004	0.002	0.020	0.005
390780002	12	0.004	0.002	0.020	0.005
390780703	12	0.004	0.002	0.020	0.005
392720704	11	0.003	0.002	0.006	0.002
390780705	9	0.003	0.001	0.009	0.002
398980706	11	0.005	0.002	0.030	0.008
396580707	9	0.023	0.002	0.070	0.027
399320801	12	0.002	0.002	0.002	0.000
394460802	14	0.002	0.002	0.002	0.000
394460803	15	0.002	0.002	0.005	0.001
392620804	14	0.002	0.002	0.002	0.000
394460805	11	0.002	0.002	0.002	0.000
392220806	15	0.002	0.002	0.002	0.000
393060601	10	0.002	0.002	0.002	0.000
393060602	13	0.002	0.002	0.002	0.000
393060604	13	0.002	0.002	0.002	0.000
393080605	14	0.002	0.002	0.002	0.000
393060603	12	0.002	0.002	0.002	0.000
390720711	17	0.002	0.002	0.002	0.000
397620712	15	0.002	0.002	0.005	0.001
398240713	12	0.002	0.002	0.002	0.000
398270714	14	0.002	0.002	0.003	0.000
397620715	12	0.002	0.002	0.002	0.000
390720716	12	0.002	0.002	0.003	0.000
394520717	7	0.002	0.002	0.002	0.000
398246713	2	0.002	0.002	0.002	0.000
397626715	3	0.002	0.002	0.002	0.000
394820717	7	0.002	0.002	0.002	0.000
395700301	10	0.002	0.002	0.002	0.000
392340302	14	0.002	0.002	0.002	0.000
398640303	11	0.002	0.001	0.003	0.000
394980304	13	0.002	0.002	0.002	0.000
392340305	11	0.002	0.002	0.002	0.000
393880306	12	0.006	0.002	0.020	0.008
392180307	11	0.002	0.002	0.002	0.000
396440501	15	0.005	0.002	0.040	0.010
394840502	15	0.004	0.002	0.032	0.008
390560503	10	0.013	0.002	0.040	0.013
390580504	13	0.018	0.002	0.090	0.028
390560505	12	0.026	0.002	0.110	0.037
397800506	15	0.034	0.002	0.220	0.060
390180507	14	0.005	0.002	0.030	0.007
390440508	14	0.010	0.002	0.080	0.021

PARAMETER: CADMIUM

METHOD: ATOMIC ABSORPTION
UNITS: MICROGRAMS/CUBIC METER

YEAR: 1972

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
395740509	15	0.015	0.002	0.120	0.030
390560510	15	0.017	0.002	0.184	0.047
399430201	10	0.003	0.002	0.010	0.003
392400202	11	0.003	0.002	0.007	0.002
394410203	9	0.002	0.002	0.002	0.000
397280204	11	0.003	0.002	0.010	0.002
399520205	13	0.004	0.002	0.020	0.005
396300206	8	0.002	0.002	0.005	0.001
399430207	11	0.006	0.002	0.020	0.007
398040208	10	0.003	0.002	0.008	0.002
395220209	14	0.003	0.002	0.020	0.005
395220210	9	0.002	0.002	0.005	0.001
399200511	14	0.002	0.002	0.004	0.001
395920512	15	0.006	0.002	0.020	0.006
399200513	15	0.003	0.002	0.013	0.003
399200514	15	0.002	0.002	0.005	0.001
399200515	13	0.002	0.002	0.007	0.001
399330516	12	0.002	0.002	0.002	0.000
397480101	10	0.002	0.002	0.002	0.000
391080102	10	0.002	0.002	0.002	0.000
396000103	4	0.003	0.002	0.006	0.002
392460104	5	0.002	0.002	0.002	0.000
391200105	11	0.002	0.002	0.003	0.000
395620106	11	0.002	0.002	0.002	0.000
391620107	13	0.003	0.002	0.006	0.001
397100108	4	0.002	0.002	0.002	0.000
397560109	8	0.006	0.002	0.010	0.004
399280110	10	0.002	0.002	0.002	0.000
394720111	9	0.005	0.002	0.020	0.006
392020112	5	0.002	0.002	0.002	0.000
397200113	7	0.002	0.002	0.002	0.000
391200114	11	0.002	0.002	0.003	0.000
391660115	8	0.024	0.002	0.150	0.051
396900116	8	0.002	0.002	0.002	0.000
391200117	7	0.002	0.002	0.002	0.000
394700311	11	0.002	0.002	0.002	0.000
394660312	11	0.002	0.002	0.002	0.000
394700313	11	0.002	0.002	0.002	0.000
394660314	11	0.002	0.002	0.003	0.000
394660315	12	0.002	0.002	0.002	0.000
394700317	11	0.002	0.002	0.002	0.000
394700316	10	0.002	0.002	0.002	0.000

PARAMETER: BERYLLIUM

METHOD: ATOMIC ABSORPTION
UNITS: MICROGRAMS/CUBIC METER

YEAR: 1971

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
399400321	23	0.002	0.002	0.002	0.000
399560322	23	0.002	0.002	0.002	0.000
399570323	23	0.002	0.002	0.002	0.000
399570324	23	0.002	0.002	0.002	0.000
399400325	24	0.002	0.002	0.002	0.000
399570326	23	0.002	0.002	0.002	0.000
393060601	36	0.002	0.002	0.008	0.001
393060602	47	0.002	0.002	0.004	0.000
393060604	40	0.002	0.002	0.003	0.000
393080605	40	0.002	0.002	0.004	0.000
393060603	36	0.002	0.002	0.002	0.000
390720711	68	0.002	0.002	0.005	0.001
397620712	70	0.003	0.002	0.005	0.001
398240713	69	0.003	0.002	0.009	0.001
398270714	69	0.003	0.002	0.005	0.001
397620715	69	0.003	0.002	0.008	0.001
390720716	69	0.004	0.002	0.029	0.004
394520717	69	0.003	0.002	0.008	0.001
395700301	67	0.808	0.002	36.000	4.583
392340302	62	0.003	0.002	0.006	0.002
398640303	54	0.002	0.002	0.002	0.000
394980304	68	0.003	0.002	0.006	0.001
392340305	63	0.002	0.002	0.006	0.001
393880306	66	0.003	0.002	0.042	0.005
392180307	58	0.003	0.002	0.006	0.001
396440501	39	0.002	0.002	0.002	0.000
394840502	39	0.002	0.002	0.003	0.000
390560503	18	0.002	0.002	0.002	0.000
390580504	17	0.002	0.002	0.002	0.000
390560505	39	0.002	0.002	0.002	0.000
397800506	17	0.002	0.002	0.002	0.000
390180507	17	0.002	0.002	0.002	0.000
390440508	17	0.002	0.002	0.002	0.000
395740509	17	0.002	0.002	0.002	0.000
390560510	17	0.002	0.002	0.002	0.000
399430201	57	0.002	0.002	0.002	0.000
392400202	57	0.002	0.002	0.002	0.000
394410203	56	0.002	0.002	0.002	0.000
397280204	57	0.002	0.002	0.002	0.000
399520205	56	0.002	0.002	0.003	0.000
396300206	57	0.002	0.002	0.002	0.000
399430207	57	0.002	0.002	0.003	0.000
398040208	57	0.002	0.002	0.003	0.000
395220209	57	0.002	0.002	0.005	0.000
395220210	28	0.002	0.002	0.002	0.000
399200511	17	0.002	0.002	0.002	0.000
395920512	17	0.002	0.002	0.002	0.000
399200513	17	0.002	0.002	0.002	0.000
399200514	17	0.002	0.002	0.002	0.000

PARAMETER: BERYLLIUM

METHOD: ATOMIC ABSORPTION
UNITS: MICROGRAMS/CUBIC METER

YEAR: 1971

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
399200515	17	0.002	0.002	0.002	0.000
399330516	17	0.002	0.002	0.002	0.000
394700311	45	0.002	0.002	0.002	0.000
394660312	46	0.002	0.002	0.002	0.000
394700313	45	0.002	0.002	0.007	0.001
394660314	48	0.002	0.002	0.002	0.000
394660315	43	0.004	0.002	0.020	0.005
394700317	49	0.002	0.002	0.002	0.000
394700316	32	0.002	0.002	0.002	0.000
394706316	5	0.002	0.002	0.002	0.000

PARAMETER: BERYLLIUM

METHOD: ATOMIC ABSORPTION
UNITS: MICROGRAMS/CUBIC METER

YEAR: 1972

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
399400321	15	0.002	0.002	0.002	0.000
399560322	12	0.002	0.002	0.002	0.000
399570323	12	0.002	0.002	0.002	0.000
399570324	14	0.002	0.002	0.002	0.000
399400325	12	0.002	0.002	0.002	0.000
399570326	14	0.002	0.002	0.002	0.000
390120701	12	0.002	0.002	0.002	0.000
390780002	12	0.002	0.002	0.002	0.000
390780703	12	0.002	0.002	0.002	0.000
392720704	11	0.002	0.002	0.002	0.000
390780705	9	0.002	0.002	0.002	0.000
398980706	11	0.002	0.002	0.002	0.000
396580707	9	0.002	0.002	0.002	0.000
399320801	12	0.002	0.002	0.002	0.000
394460802	14	0.002	0.002	0.002	0.000
394460803	15	0.002	0.002	0.002	0.000
392620804	14	0.002	0.002	0.002	0.000
394460805	11	0.002	0.002	0.002	0.000
392220806	15	0.002	0.002	0.002	0.000
390720716	24	0.003	0.002	0.017	0.003
396440501	15	0.002	0.002	0.002	0.000
394840502	14	0.002	0.002	0.002	0.000
390560503	10	0.002	0.002	0.002	0.000
390580504	14	0.088	0.002	1.212	0.323
390560505	12	0.002	0.002	0.002	0.000
397800506	15	0.002	0.002	0.002	0.000
390180507	14	0.002	0.002	0.002	0.000
390440508	14	0.002	0.002	0.002	0.000
395740509	15	0.002	0.002	0.002	0.000
390560510	15	0.002	0.002	0.002	0.000
399200511	14	0.002	0.002	0.002	0.000
395920512	15	0.002	0.002	0.002	0.000
399200513	15	0.002	0.002	0.002	0.000
399200514	15	0.002	0.002	0.002	0.000
399200515	13	0.002	0.002	0.002	0.000
399330516	12	0.002	0.002	0.002	0.000
397480101	10	0.002	0.002	0.002	0.000
391080102	11	0.002	0.002	0.002	0.000
396000103	4	0.002	0.002	0.002	0.000
392460104	4	0.002	0.002	0.002	0.000
391200105	9	0.002	0.002	0.002	0.000
395620106	11	0.002	0.002	0.002	0.000
391620107	11	0.002	0.002	0.002	0.000
397100108	4	0.002	0.002	0.002	0.000
397560109	8	0.002	0.002	0.002	0.000
399280110	10	0.002	0.002	0.002	0.000
394720111	9	0.002	0.002	0.002	0.000
392020112	5	0.002	0.002	0.002	0.000
397200113	7	0.002	0.002	0.002	0.000

PARAMETER: BERYLLIUM

METHOD: ATOMIC ABSORPTION
UNITS: MICROGRAMS/CUBIC METER

YEAR: 1972

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
391200114	11	0.002	0.002	0.002	0.000
391660115	8	0.002	0.002	0.002	0.000
396900116	8	0.002	0.002	0.002	0.000
391200117	7	0.002	0.002	0.002	0.000

PARAMETER: LEAD

METHOD: ATOMIC ABSORPTION
UNITS: MICROGRAMS/CUBIC METER

YEAR: 1971

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
399400321	20	0.554	0.010	1.200	0.379
399560322	20	0.654	0.010	1.500	0.360
399570323	20	0.710	0.010	2.860	0.699
399570324	20	0.383	0.010	1.610	0.434
399400325	21	0.455	0.010	1.260	0.396
399570326	20	0.649	0.010	1.780	0.494
393060601	41	0.336	0.010	0.670	0.189
393060602	45	0.691	0.000	1.530	0.320
393060604	44	0.577	0.010	1.150	0.248
393080605	41	0.277	0.010	0.820	0.171
393060603	38	0.707	0.220	1.090	0.209
390720711	49	0.449	0.010	1.340	0.351
397620712	52	0.688	0.010	1.780	0.462
398240713	48	0.692	0.010	2.950	0.609
398270714	51	0.449	0.010	3.080	0.487
397620715	51	1.404	0.010	5.360	1.084
390720716	51	0.798	0.000	2.720	0.703
394820717	50	2.245	0.010	13.300	2.473
395700301	33	0.542	0.010	1.420	0.311
392340302	21	0.414	0.010	1.230	0.296
398640303	10	0.684	0.310	1.330	0.299
394980304	31	0.841	0.010	1.750	0.438
392340305	27	0.497	0.010	1.150	0.314
393880306	31	0.631	0.010	1.810	0.402
392180307	25	0.257	0.010	0.800	0.191
396440501	39	0.890	0.010	2.630	0.637
394840502	39	0.387	0.010	2.880	0.499
390560503	18	0.733	0.010	1.870	0.754
390580504	17	0.646	0.010	1.520	0.464
390560505	37	0.337	0.010	1.240	0.372
397800506	17	0.869	0.010	1.590	0.514
390180507	17	0.760	0.010	1.920	0.524
390440508	17	1.496	0.010	6.540	1.460
395740509	17	0.669	0.010	1.420	0.457
390560510	17	0.264	0.010	0.710	0.200
399430201	57	0.665	0.010	1.730	0.445
392400202	57	0.396	0.001	1.630	0.429
394410203	57	0.312	0.001	0.850	0.229
397280204	57	0.579	0.010	1.560	0.408
399520205	58	0.430	0.001	1.380	0.363
396300206	51	0.103	0.010	0.900	0.220
399430207	56	0.655	0.010	2.060	0.447
398040208	57	0.756	0.010	1.930	0.607
395220209	58	0.631	0.010	2.090	0.492
395220210	17	0.347	0.010	1.070	0.271
399200511	17	0.474	0.010	1.630	0.495
395920512	17	0.875	0.010	2.090	0.694
399200513	17	0.552	0.010	2.330	0.648
399200514	17	0.739	0.010	1.940	0.672

PARAMETER: LEAD

METHOD: ATOMIC ABSORPTION
UNITS: MICROGRAMS/CUBIC METER

YEAR: 1971

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
399200515	17	0.740	0.010	2.300	0.739
399330516	17	0.419	0.010	1.660	0.434
394700311	35	0.510	0.010	1.590	0.441
394660312	35	0.673	0.010	1.250	0.354
394700313	35	0.527	0.010	1.410	0.407
394660314	35	0.763	0.010	2.110	0.516
394660315	35	0.776	0.010	2.150	0.567
394700317	35	0.580	0.010	1.560	0.450
394700316	23	0.366	0.010	0.980	0.289
394706316	6	0.277	0.010	0.490	0.188

PARAMETER: LEAD

METHOD: ATOMIC ABSORPTION
UNITS: MICROGRAMS/CUBIC METER

YEAR: 1972

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
399400321	14	0.558	0.010	1.720	0.428
399560322	12	0.690	0.050	1.860	0.462
399570323	14	0.586	0.180	1.420	0.378
399570324	14	0.386	0.010	1.150	0.315
399400325	14	0.523	0.010	1.350	0.383
399570326	13	0.699	0.250	1.730	0.447
390120701	13	0.409	0.010	0.970	0.272
390780002	12	0.297	0.070	0.690	0.190
390780703	10	0.456	0.010	0.990	0.300
392720704	10	0.674	0.270	1.370	0.346
390780705	8	0.437	0.200	0.640	0.166
398980706	9	0.436	0.010	0.830	0.314
396580707	10	0.309	0.070	0.790	0.201
399320801	12	0.168	0.010	0.610	0.158
394460802	15	0.465	0.010	0.910	0.253
394460803	15	0.634	0.010	1.080	0.309
392620804	14	1.006	0.280	2.490	0.639
394460805	15	0.423	0.040	1.120	0.297
392220806	14	0.554	0.010	1.030	0.277
393060602	1	0.840	0.840	0.840	
393060604	1	0.370	0.370	0.370	
393080605	1	0.260	0.260	0.260	
393060603	1	1.080	1.080	1.080	
394520717	14	1.203	0.010	3.470	1.083
394820717	14	0.979	0.010	2.380	0.665
396440501	13	1.270	0.300	7.130	1.784
394840502	14	0.307	0.010	0.580	0.147
390560503	11	0.441	0.010	0.900	0.287
390580504	13	0.462	0.010	1.410	0.382
390560505	12	0.434	0.070	1.000	0.281
397800506	12	0.612	0.150	1.310	0.394
390180507	14	0.534	0.010	1.400	0.380
390440508	13	0.700	0.010	1.320	0.424
395740509	15	0.703	0.230	1.570	0.432
390560510	13	0.230	0.001	0.600	0.208
399200511	13	0.850	0.060	2.430	0.624
395920512	14	0.824	0.010	2.020	0.560
399200513	15	0.547	0.070	1.630	0.422
399200514	11	0.525	0.010	1.170	0.368
399200515	14	0.954	0.260	2.590	0.657
399330516	13	0.410	0.100	1.880	0.461
397480101	9	0.458	0.010	0.790	0.293
391080102	10	0.688	0.280	1.320	0.283
396000103	3	0.677	0.380	1.070	0.355
392460104	4	0.375	0.240	0.520	0.119
391200105	9	0.579	0.050	1.450	0.495
395620106	10	0.448	0.010	0.740	0.254
391620107	10	0.542	0.010	1.490	0.469
397100108	7	0.276	0.010	0.510	0.185

PARAMETER: LEAD

METHOD: ATOMIC ABSORPTION
UNITS: MICROGRAMS/CUBIC METER

YEAR: 1972

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
397560109	7	0.283	0.160	0.470	0.103
399280110	11	0.638	0.120	1.150	0.286
394720111	10	0.432	0.080	0.780	0.224
392020112	3	0.660	0.250	0.910	0.358
397200113	3	0.453	0.330	0.570	0.120
391200114	10	0.456	0.160	0.700	0.200
391660115	10	0.593	0.180	1.100	0.302
396900116	8	0.302	0.130	0.580	0.180
391200117	9	0.302	0.080	0.610	0.196

PARAMETER: LEAD

METHOD: ATOMIC ABSORPTION
UNITS: MICROGRAMS/CUBIC METER

YEAR: 1973

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
390120701	8	1.5	0.3	3.8	1.0
390780002	6	1.5	0.0	5.8	2.2
390780703	8	1.2	0.5	2.8	0.8
392720704	8	1.2	0.4	2.4	0.6
390780705	8	1.6	0.4	6.4	2.0
398980706	8	1.2	0.1	3.3	1.0
396580707	8	0.5	0.0	1.5	0.5
396780002	2	0.5	0.1	1.0	0.6

PARAMETER: ARSENIC

METHOD: ATOMIC ABSORPTION
UNITS: MICROGRAMS/CUBIC METER

YEAR: 1972

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
399400321	15	0.25	0.05	0.81	0.21
399560322	12	0.18	0.05	0.44	0.17
399570323	12	0.19	0.05	0.76	0.22
399570324	14	0.18	0.05	0.98	0.25
399400325	12	0.22	0.05	1.02	0.29
399570326	14	0.23	0.05	0.96	0.31
390120701	12	0.20	0.05	0.64	0.21
390780002	12	0.19	0.05	0.62	0.18
390780703	12	0.15	0.05	0.44	0.15
392720704	12	0.22	0.05	0.82	0.27
390780705	9	0.24	0.05	0.66	0.23
398980706	11	0.16	0.05	0.70	0.20
396580707	9	0.21	0.05	0.56	0.17
399320801	12	0.15	0.05	0.52	0.15
394460802	14	0.17	0.05	0.59	0.18
394460803	15	0.15	0.05	0.63	0.15
392620804	14	0.19	0.05	0.53	0.16
394460805	11	0.17	0.05	0.52	0.17
392220806	15	0.24	0.05	0.96	0.27
393060601	10	0.13	0.05	0.33	0.11
393060602	10	0.16	0.05	0.34	0.12
393060604	13	0.10	0.05	0.31	0.08
393080605	12	0.17	0.05	0.38	0.13
393060603	12	0.14	0.05	0.45	0.14
390720711	14	0.32	0.05	1.63	0.48
397620712	15	0.13	0.05	0.63	0.15
398240713	12	0.30	0.05	1.53	0.41
396270714	14	0.32	0.05	1.23	0.37
397620715	10	0.24	0.05	0.64	0.22
390720716	11	0.51	0.05	1.76	0.61
394520717	5	0.11	0.05	0.22	0.08
398246713	2	0.19	0.08	0.30	0.16
397626715	3	0.06	0.05	0.09	0.02
394820717	7	0.10	0.05	0.32	0.10
395700301	10	0.13	0.05	0.46	0.13
392340302	14	0.16	0.05	0.41	0.12
398640303	11	0.13	0.05	0.40	0.12
394980304	14	0.16	0.05	0.45	0.15
392340305	13	0.15	0.05	0.62	0.17
393880306	12	0.11	0.05	0.52	0.13
392180307	11	0.09	0.05	0.21	0.05
396440501	15	0.19	0.05	0.68	0.17
394840502	15	0.21	0.05	0.68	0.22
390560503	10	0.10	0.05	0.24	0.08
390560504	13	0.19	0.05	0.57	0.17
390560505	12	0.22	0.05	0.63	0.18
397800506	15	0.17	0.05	0.80	0.19
390180507	14	0.20	0.05	0.77	0.20
390440508	14	0.16	0.05	0.56	0.17

PARAMETER: ARSENIC

METHOD: ATOMIC ABSORPTION
UNITS: MICROGRAMS/CUBIC METER

YEAR: 1972

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
395740509	15	0.18	0.05	0.53	0.18
390560510	15	0.16	0.05	0.40	0.13
399430201	10	0.10	0.05	0.35	0.11
392400202	11	0.12	0.02	0.58	0.16
394410203	10	0.18	0.02	0.69	0.23
397280204	11	0.20	0.05	0.59	0.20
399520205	13	0.14	0.05	0.38	0.11
396300206	8	0.16	0.05	0.43	0.15
399430207	11	0.21	0.05	0.50	0.18
398040208	10	0.15	0.05	0.71	0.20
395220209	14	0.21	0.02	0.46	0.14
395220210	9	0.11	0.05	0.35	0.10
399200511	14	0.21	0.05	0.70	0.19
395920512	15	0.21	0.05	0.57	0.19
399200513	15	0.30	0.05	1.32	0.34
399200514	15	0.26	0.05	1.13	0.29
399200515	13	0.13	0.01	0.35	0.10
399330516	12	0.15	0.05	0.58	0.16
397480101	10	0.36	0.05	0.91	0.27
391080102	11	0.12	0.05	0.27	0.09
396000103	4	0.14	0.05	0.36	0.15
392460104	5	0.15	0.05	0.36	0.12
391200105	11	0.19	0.05	0.50	0.17
395620106	11	0.12	0.05	0.38	0.11
391620107	11	0.19	0.05	0.55	0.16
397100108	4	0.33	0.05	0.93	0.42
397560109	8	0.25	0.05	0.48	0.15
399280110	10	0.15	0.05	0.36	0.12
394720111	9	0.12	0.05	0.52	0.15
392020112	5	0.18	0.05	0.33	0.13
397200113	7	0.09	0.05	0.15	0.05
391200114	11	0.15	0.05	0.80	0.22
391660115	8	0.14	0.05	0.41	0.16
396900116	8	0.23	0.05	0.71	0.24
391200117	7	0.15	0.05	0.42	0.15
394700311	11	0.16	0.05	0.34	0.11
394660312	11	0.10	0.05	0.23	0.07
394700313	11	0.18	0.05	0.78	0.22
394660314	11	0.21	0.05	0.93	0.31
394660315	12	0.20	0.05	0.93	0.25
394700317	11	0.22	0.05	0.70	0.20
394700316	10	0.18	0.05	0.49	0.14

PARAMETER: ARSENIC

METHOD: ATOMIC ABSORPTION
UNITS: NANOGRAMS/CUBIC METER

YEAR: 1972

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
399400321	8	328	50	915	344
399560322	7	530	50	1851	679
399570323	8	720	50	1868	666
399570324	8	422	50	1550	518
399400325	8	695	50	1648	632
399570326	7	523	50	1240	529
390120701	7	432	50	961	312
390780002	7	321	50	1118	391
390780703	8	407	50	1081	414
392720704	8	339	50	882	354
390780705	7	288	50	975	327
398980706	8	417	50	1050	388
396580707	7	235	50	550	207
399320801	8	530	50	1667	619
394460802	8	456	50	1400	575
394460803	7	606	50	2803	982
392620804	8	523	50	1117	452
394460805	8	362	50	896	325
392220806	5	348	50	832	329
393060601	5	518	50	957	339
393060602	7	395	98	811	243
393060604	7	557	50	1372	474
393060605	9	413	19	1356	422
393060603	8	169	50	551	188
390720711	8	353	50	751	291
398240713	8	378	50	765	289
398270714	8	250	50	598	232
397620715	8	190	5	405	156
390720716	6	193	5	562	243
394520717	2	7	5	9	3
394820717	9	299	50	1524	466
395700301	6	136	8	378	137
392340302	8	641	50	1586	562
396640303	6	382	50	764	252
394980304	8	472	50	1402	532
393880306	7	748	50	2231	803
392180307	7	346	50	1037	361
396440501	8	577	50	1391	488
394840502	8	241	50	582	170
390560503	8	330	50	990	387
390580504	8	512	50	1580	555
390560505	8	377	50	1626	529
397800506	8	520	50	1140	421
390180507	8	387	50	977	361
390440508	8	550	50	1962	615
395740509	8	457	50	1489	521
390560510	4	523	176	1265	507
399430201	5	190	50	624	249
392400202	6	321	145	534	144

PARAMETER: ARSENIC

METHOD: ATOMIC ABSORPTION
UNITS: NANOGRAMS/CUBIC METER

YEAR: 1972

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	ST[illegible] DEV[illegible]
394410203	7	345	50	1305	[illegible]42
397280204	7	309	50	1163	396
396300206	8	288	28	1068	363
399430207	6	571	50	1900	681
398040208	6	221	50	407	187
395220209	7	148	50	360	144
395220210	6	287	50	695	301
399200511	8	395	50	1340	428
395920512	8	248	50	527	182
399200513	8	350	50	802	342
399200514	8	628	105	1101	351
399200515	3	271	50	1032	323
399330516	7	349	50	925	284
397480101	2	182	50	314	187
391080102	4	442	50	1060	436
396000103	6	185	50	553	197
392460104	7	603	50	1588	566
391200105	7	187	50	451	176
395620106	2	300	110	490	269
391620107	6	501	50	1666	611
397100108	6	199	50	521	181
397560109	6	708	414	1172	328
399280110	5	599	158	1140	382
394720111	4	327	50	725	323
392020112	4	575	50	1009	404
397200113	3	555	50	953	461
391200114	7	473	132	855	246
391660115	4	732	229	1156	470
396900116	4	416	50	907	357
391200117	4	202	50	572	250
394700311	8	460	50	1038	361
394660312	8	389	50	1026	382
394700313	8	305	50	1019	355
394660314	8	533	50	1324	568
394660315	8	272	50	571	245
394700317	8	419	50	901	334
394700316	8	494	50	1433	422

PARAMETER: CADMIUM

METHOD: ATOMIC ABSORPTION
UNITS: NANOGRAMS/CUBIC METER

YEAR: 1972

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
399400321	15	2	2	6	1
399560322	15	2	2	9	2
399570323	16	3	2	7	2
399570324	16	2	2	2	0
399400325	15	2	2	5	1
399570326	15	2	2	6	1
390120701	14	7	2	29	10
390780002	13	4	2	13	4
390780703	16	4	2	12	3
392720704	16	4	2	16	4
390780705	15	4	2	11	3
398980706	14	6	2	33	10
396580707	14	26	2	155	40
399320801	16	2	2	9	2
394460802	16	3	2	20	5
394460803	15	3	2	13	3
392620804	16	3	2	25	6
394460805	16	3	2	16	4
392220806	14	149	2	1178	340
393060601	10	2	2	2	0
393060602	14	2	2	2	0
393060604	14	2	2	2	0
393080605	14	2	2	2	0
393060603	13	2	2	2	0
390720711	13	3	2	11	3
398240713	16	18	2	250	62
398270714	16	2	2	6	1
397620715	13	11	2	110	30
390720716	13	3	2	13	3
394820717	17	3	2	14	4
395700301	13	5	2	36	9
392340302	16	2	2	3	0
398640303	14	5	2	39	10
394980304	16	2	2	5	1
393880306	15	2	2	7	1
392180307	12	2	2	3	0
396440501	16	4	2	11	3
394840502	16	8	2	60	15
390560503	16	11	2	67	18
390580504	16	18	2	97	27
390560505	16	51	2	300	73
397800506	16	20	2	78	24
390180507	16	6	2	37	9
390440508	16	14	2	49	17
395740509	16	16	2	135	32
390560510	12	18	2	68	21
399430201	9	3	2	8	2
392400202	12	3	2	13	3
394410203	12	3	2	7	1

PARAMETER: CADMIUM

METHOD: ATOMIC ABSORPTION
UNITS: NANOGRAMS/CUBIC METER

YEAR: 1972

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
397280204	13	4	2	18	4
396300206	12	2	2	2	0
399430207	12	4	2	15	4
398040208	11	3	2	16	4
395220209	12	6	2	38	10
395220210	11	5	2	30	8
399200511	16	7	2	28	9
395920512	16	9	2	28	8
399200513	16	4	2	25	6
399200514	16	3	2	15	3
399200515	16	3	2	12	3
399330516	12	5	2	19	5
397480101	7	2	2	3	0
391080102	8	3	2	13	4
396000103	7	2	2	2	0
392460104	12	2	2	4	1
391200105	12	2	2	2	0
395620106	10	3	2	9	2
391620107	11	3	2	5	1
397100108	11	3	2	13	3
397560109	12	31	2	304	86
399280110	9	4	2	14	4
394720111	11	67	2	704	211
392020112	10	4	2	20	6
397200113	9	3	2	9	2
391200114	14	3	2	9	2
391660115	11	3	2	5	1
396900116	6	2	2	2	0
391200117	10	3	2	9	2
394700311	15	2	2	4	1
394660312	16	2	2	2	0
394700313	16	2	2	4	1
394660314	16	2	2	2	0
394660315	16	2	2	3	0
394700317	15	2	2	2	0
394700316	16	2	2	4	1

PARAMETER: BERYLLIUM

METHOD: ATOMIC ABSORPTION
UNITS: NANOGRAMS/CUBIC METER

YEAR: 1972

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
399400321	15	2	2	2	0
399560322	15	2	2	2	0
399570323	16	2	2	2	0
399570324	16	2	2	2	0
399400325	15	2	2	2	0
399570326	15	2	2	2	0
390120701	14	2	2	2	0
390780002	13	2	2	2	0
390780703	16	2	2	2	0
392720704	16	2	2	2	0
390780705	15	2	2	2	0
398980706	14	2	2	2	0
396580707	14	2	2	2	0
399320801	16	2	2	2	0
394460802	16	2	2	2	0
394460803	15	2	2	2	0
392620804	16	2	2	2	0
394460805	16	2	2	2	0
392220806	14	2	2	2	0
390720716	28	3	2	9	2
396440501	16	2	2	2	0
394840502	16	2	2	2	0
390560503	16	2	2	2	0
390580504	16	2	2	2	0
390560505	16	2	2	2	0
397800506	16	2	2	2	0
390160507	16	2	2	2	0
390440508	16	2	2	2	0
395740509	16	2	2	2	0
390560510	12	2	2	2	0
399200511	15	2	2	2	0
395920512	15	2	2	2	0
399200513	15	2	2	2	0
399200514	15	2	2	2	0
399200515	15	2	2	2	0
399330516	12	2	2	2	0
397480101	7	2	2	2	0
391080102	11	2	2	2	0
396000103	10	2	2	2	0
392460104	13	2	2	2	0
391200105	14	2	2	2	0
395620106	10	2	2	2	0
391620107	13	2	2	2	0
397100108	13	2	2	2	0
397560109	13	2	2	2	0
399280110	12	2	2	2	0
394720111	10	2	2	2	0
392020112	10	2	2	2	0
397200113	9	2	2	2	0

PARAMETER: BERYLLIUM

METHOD: ATOMIC ABSORPTION
UNITS: NANOGRAMS/CUBIC METER

YEAR: 1972

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
391200114	14	2	2	2	0
391660115	11	2	2	2	0
396900116	6	2	2	2	0
391200117	10	2	2	2	0

PARAMETER: LEAD

METHOD: ATOMIC ABSORPTION
UNITS: NANOGRAMS/CUBIC METER

YEAR: 1972

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
399400321	15	734	11	1559	443
399560322	15	870	371	1645	329
399570323	15	670	267	1474	346
399570324	15	545	174	1229	297
399400325	15	680	225	1473	374
399570326	15	911	2	2063	464
390120701	14	780	313	1943	410
390780002	14	468	10	1024	286
390780703	18	827	75	1612	479
392720704	17	714	18	1437	398
390780705	12	547	10	1254	346
398980706	17	661	1	2108	542
396580707	14	622	190	2214	510
399320801	15	268	119	1023	221
394460802	15	664	199	1461	328
394460803	15	967	378	1898	393
392620804	15	834	382	1751	354
394460805	14	816	268	1702	417
392220806	15	1047	632	2208	507
394820717	29	1701	10	4460	1256
396440501	14	1243	10	2990	715
394840502	14	520	10	893	236
390560503	15	858	10	2068	640
390580504	15	723	353	1355	284
390560505	15	762	10	2128	556
397800506	17	651	1	1532	396
390180507	15	749	10	1396	383
390440508	15	949	293	1759	459
395740509	14	699	10	1197	333
390560510	11	585	196	1681	409
399200511	15	830	372	1664	395
395920512	15	1131	582	1809	419
399200513	15	718	62	1255	363
399200514	18	667	9	1538	478
399200515	14	603	261	1492	335
399330516	9	780	450	1550	353
397480101	11	984	1	1850	630
391080102	12	1237	305	2800	768
396000103	14	1097	1	3423	827
392460104	13	437	1	952	323
391200105	14	743	176	1233	338
395620106	12	847	1	2176	614
391620107	12	1024	1	2641	641
397100108	11	521	1	931	315
397560109	11	1367	337	8060	2229
399280110	13	856	199	2316	516
394720111	9	746	10	1664	545
392020112	10	1146	10	2877	942
397200113	12	569	10	1404	359

PARAMETER: LEAD

METHOD: ATOMIC ABSORPTION
UNITS: NANOGRAMS/CUBIC METER

YEAR: 1972

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
391200114	13	638	10	1787	433
391660115	11	811	10	1743	431
396900116	11	210	10	688	253
391200117	11	296	10	607	202

PARAMETER: LEAD

METHOD: ATOMIC ABSORPTION
UNITS: NANOGRAMS/CUBIC METER

YEAR: 1973

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
399400321	21	593	224	1057	225
399560322	21	781	328	1317	316
399570323	19	440	159	882	197
399570324	19	412	39	782	230
399400325	20	452	135	822	188
399570326	21	778	207	1517	388
390120701	20	675	281	1321	261
390780002	22	462	26	1057	271
390780703	20	791	449	1331	240
392720704	22	860	413	1714	333
390780705	20	481	92	913	224
398980706	20	551	136	1219	285
396580707	11	386	36	854	224
390580707	7	534	195	1209	341
399320801	21	156	55	337	84
394460802	22	684	221	1478	293
394460803	22	1024	461	1942	345
392620804	22	1104	371	1925	374
394460805	22	647	215	1137	258
392220806	22	1106	493	1875	382
393060601	14	309	54	748	169
393060602	18	664	36	1684	368
393060604	19	624	187	1348	315
393080605	20	283	10	842	214
393060603	19	846	356	1951	388
390720711	20	476	26	1036	267
397620712	7	1230	422	1928	460
398240713	13	368	94	756	174
398270714	19	526	90	1043	261
397620715	12	1938	463	3625	1015
390720716	22	1098	288	3348	601
394520717	19	1672	31	4835	1059
398246713	8	378	117	665	189
397626715	8	1422	535	3469	960
395700301	22	778	322	1613	334
392340302	22	512	156	925	243
398640303	22	1089	497	3030	566
394980304	24	952	284	1568	358
392340305	3	1914	1585	2536	539
393880306	21	676	251	1233	278
392180307	19	374	94	950	227
396440501	28	1358	341	6917	1226
394840502	29	431	66	803	195
390560503	25	1009	366	2806	513
390580504	27	854	222	3199	613
390560505	30	916	185	3163	572
397800506	30	811	350	1602	351
390180507	29	863	93	2443	478
390440508	28	1064	375	2654	471

PARAMETER: LEAD

METHOD: ATOMIC ABSORPTION
UNITS: NANOGRAMS/CUBIC METER

YEAR: 1973

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
395740509	29	911	207	2176	397
390560510	27	520	48	1869	435
399430201	17	441	181	1147	234
392400202	22	765	313	1312	240
394410203	20	501	170	876	160
397280204	22	913	399	1363	302
399520205	1	1225	1225	1225	
396300206	21	385	15	1124	237
399430207	21	733	388	1343	262
398040208	16	838	329	1418	338
395220209	17	1100	428	2030	523
395220210	20	489	210	842	180
399200511	21	604	287	895	194
395920512	19	1157	492	2713	566
399200513	21	962	283	8274	1705
399200514	20	720	65	1465	423
399200515	21	834	26	1902	382
399330516	18	464	84	1243	335
399300516	3	772	369	1449	590
397480101	22	581	231	1187	277
391080102	20	996	483	1991	410
396000103	20	1013	48	2275	535
392460104	15	620	161	1273	308
391200105	22	583	73	1638	335
395620106	20	934	287	1740	390
391620107	21	946	252	2068	473
397100108	14	452	168	871	219
397560109	22	465	154	789	191
399280110	16	546	26	1016	287
394720111	12	579	26	1495	461
392020112	17	876	273	1776	356
397200113	19	901	121	4653	1061
391200114	20	722	169	1704	371
391660115	20	719	179	2070	482
396900116	10	424	123	788	210
391200117	16	238	42	452	128
394700311	19	638	41	5035	1087
394660312	21	673	151	1369	292
394700313	20	763	420	1255	262
394660314	22	786	27	1585	393
394660315	18	1350	118	7751	1677
394700317	22	713	194	1505	373
394700316	22	480	114	923	250

ALLEGHENY COUNTY BUREAU OF AIR POLLUTION CONTROL

SAROAD DAILY DATA

PARAMETER: LEAD

METHOD: ATOMIC ABSORPTION
UNITS: MICROGRAMS/CUBIC METER

YEAR: 1971

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
391702001	25	0.037	0.001	0.089	0.024
390100067	24	0.013	0.000	0.083	0.018
390100068	33	0.014	0.000	0.151	0.029
390100065	33	0.019	0.000	0.118	0.027
397260012	36	0.037	0.000	0.105	0.038
397260005	29	0.039	0.000	0.233	0.064
317260005	6	0.034	0.000	0.081	0.035
397260006	32	0.037	0.000	0.249	0.057
390100066	31	0.014	0.000	0.085	0.022
398540002	31	0.016	0.000	0.110	0.025
390100064	34	0.019	0.000	0.088	0.025
399310001	28	0.022	0.000	0.115	0.034

PARAMETER: LEAD

METHOD: ATOMIC ABSORPTION
UNITS: MICROGRAMS/CUBIC METER

YEAR: 1972

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
390100067	11	0.024	0.000	0.076	0.022
390100068	12	0.023	0.000	0.048	0.017
390100065	11	0.077	0.029	0.188	0.047
397260012	12	0.062	0.000	0.136	0.045
397260005	15	0.128	0.000	0.319	0.088
397260006	10	0.118	0.067	0.189	0.036
390100066	12	0.037	0.000	0.072	0.023
398540002	11	0.026	0.000	0.063	0.018
390100064	10	0.029	0.012	0.049	0.015
399310001	12	0.043	0.000	0.077	0.019
390660001	11	0.085	0.000	0.276	0.084
398540001	5	0.038	0.000	0.093	0.035
393640001	10	0.050	0.016	0.125	0.032
392580001	2	0.098	0.097	0.100	0.002
391720001	9	0.045	0.022	0.086	0.021

PARAMETER: LEAD

METHOD: ATOMIC ABSORPTION
UNITS: MICROGRAMS/CUBIC METER

YEAR: 1973

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
390100067	16	0.0376	0.0010	0.1180	0.0273
390100068	16	0.0327	0.0060	0.0950	0.0228
390100065	16	0.0741	0.0060	0.1710	0.0435
397260012	12	0.0347	0.0080	0.0830	0.0222
397260005	15	0.1417	0.0390	0.2840	0.0942
397260006	15	0.1516	0.0540	0.3830	0.1078
390100066	16	0.0434	0.0030	0.1090	0.0279
398540002	15	0.0604	0.0050	0.1500	0.0476
390100064	15	0.0313	0.0004	0.0910	0.0286
399310001	15	0.0745	0.0300	0.1550	0.0325
390660001	15	0.1179	0.0130	0.3400	0.0897
398540001	16	0.0590	0.0050	0.1470	0.0406
393640001	14	0.0455	0.0080	0.1040	0.0281
392530001	15	0.0820	0.0290	0.2310	0.0535
391720001	16	0.0587	0.0035	0.1560	0.0409
390100084	8	0.0375	0.0070	0.0580	0.0192
390960002	6	0.1027	0.0260	0.1620	0.0581
390960001	12	0.0701	0.0080	0.1560	0.0512
397260017	13	0.1840	0.0120	0.4280	0.1386

PARAMETER: CADMIUM

METHOD: ATOMIC ABSORPTION
UNITS: MICROGRAMS/CUBIC METER

YEAR: 1971

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
391702001	25	0.0023	0.0000	0.0075	0.0022
390100067	24	0.0015	0.0000	0.0059	0.0014
390100068	33	0.0018	0.0000	0.0127	0.0026
390100065	33	0.0010	0.0000	0.0046	0.0014
397260012	36	0.0020	0.0000	0.0071	0.0020
397260005	29	0.0011	0.0000	0.0062	0.0016
317260005	6	0.0028	0.0004	0.0106	0.0039
397260006	32	0.0016	0.0000	0.0093	0.0021
390100066	31	0.0023	0.0000	0.0188	0.0044
398540002	31	0.0015	0.0000	0.0050	0.0015
390100064	34	0.0031	0.0000	0.0136	0.0038
399310001	28	0.0013	0.0000	0.0052	0.0016

PARAMETER: CADMIUM

METHOD: ATOMIC ABSORPTION
UNITS: MICROGRAMS/CUBIC METER

YEAR: 1972

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
390100067	11	0.0012	0.0000	0.0045	0.0014
390100068	12	0.0022	0.0000	0.0071	0.0030
390100065	11	0.0020	0.0000	0.0052	0.0021
397260012	12	0.0015	0.0000	0.0049	0.0016
397260005	15	0.0015	0.0000	0.0093	0.0024
397260006	10	0.0025	0.0000	0.0046	0.0017
390100066	12	0.0015	0.0000	0.0086	0.0023
398540002	11	0.0015	0.0000	0.0087	0.0027
390100064	10	0.0022	0.0000	0.0112	0.0034
399310001	12	0.0011	0.0000	0.0060	0.0017
390660001	11	0.0019	0.0000	0.0064	0.0020
398540001	5	0.0024	0.0000	0.0104	0.0045
393640001	10	0.0015	0.0000	0.0045	0.0016
392580001	2	0.0014	0.0012	0.0017	0.0004
391720001	9	0.0013	0.0000	0.0055	0.0017

PARAMETER: CADMIUM

METHOD: ATOMIC ABSORPTION
UNITS: MICROGRAMS/CUBIC METER

YEAR: 1973

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
390100067	16	0.0073	0.0009	0.0416	0.0100
390100068	16	0.0046	0.0000	0.0202	0.0059
390100065	16	0.0072	0.0007	0.0505	0.0125
397260012	12	0.0065	0.0009	0.0248	0.0082
397260005	15	0.0059	0.0008	0.0186	0.0055
397260006	15	0.0052	0.0008	0.0233	0.0061
390100066	16	0.0098	0.0003	0.0829	0.0213
398540002	15	0.0038	0.0000	0.0220	0.0053
390100064	13	0.0194	0.0004	0.1880	0.0514
399310001	15	0.0100	0.0009	0.0473	0.0153
390660001	15	0.0095	0.0008	0.0462	0.0131
396540001	16	0.0046	0.0000	0.0243	0.0077
393640001	14	0.0056	0.0004	0.0276	0.0074
392580001	15	0.0054	0.0003	0.0283	0.0072
391720001	14	0.0045	0.0005	0.0143	0.0046
390100084	8	0.0017	0.0004	0.0048	0.0017
390960002	6	0.0024	0.0004	0.0070	0.0024
390960001	12	0.0101	0.0009	0.0466	0.0137
397260017	13	0.0055	0.0000	0.0214	0.0067

MISSOURI AIR CONSERVATION COMMISSION

SAROAD DAILY DATA

PARAMETER: LEAD

METHOD: ATOMIC ABSORPTION
UNITS: MICROGRAMS/CUBIC METER

YEAR: 1972

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
262360002	11	0.89	0.30	1.30	0.36
261120003	4	1.04	0.50	1.46	0.41
262200004	7	5.51	0.90	13.70	4.73
262980001	9	0.15	0.00	0.50	0.17
261740001	9	0.10	0.00	0.20	0.10
262360001	3	0.50	0.12	0.90	0.39

PARAMETER: LEAD

METHOD: ATOMIC ABSORPTION
UNITS: MICROGRAMS/CUBIC METER

YEAR: 1973

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
262360002	20	0.71	0.00	2.13	0.58
261120003	26	0.70	0.26	1.78	0.37
262200004	30	7.07	1.14	47.36	8.72
262980001	34	0.11	0.00	0.35	0.09
261740001	34	0.14	0.00	0.70	0.14
262360001	10	0.42	0.01	0.73	0.21
261120002	4	0.48	0.29	0.61	0.14
264260002	1	0.54	0.54	0.54	
264260003	1	0.23	0.23	0.23	
262280005	11	19.14	0.63	141.20	41.00
263020001	6	0.36	0.19	0.78	0.21
263020004	6	0.56	0.26	1.00	0.26
264540002	1	0.64	0.64	0.64	
260700002	2	0.48	0.18	0.78	0.42
263800002	6	0.30	0.21	0.42	0.08
263800001	1	0.22	0.22	0.22	
261920002	4	0.57	0.40	0.79	0.18
264100001	3	0.36	0.29	0.51	0.13
262440001	3	0.47	0.25	0.63	0.20
264740001	3	0.28	0.20	0.39	0.10
263740001	5	0.48	0.20	1.12	0.37
263280001	10	0.39	0.12	0.92	0.29
264320001	1	0.70	0.70	0.70	
262760001	1	0.19	0.19	0.19	
262200006	1	0.31	0.31	0.31	

PARAMETER: LEAD

METHOD: ATOMIC ABSORPTION
UNITS: MICROGRAMS/CUBIC METER

YEAR: 1974

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
261120003	6	0.34	0.20	0.67	0.17
262200004	4	4.44	2.51	8.31	2.62
262980001	9	0.14	0.03	0.20	0.05
261740001	8	0.17	0.03	0.34	0.11
262360001	9	0.43	0.05	0.93	0.23
261120002	8	0.41	0.13	0.90	0.22
264260002	8	0.42	0.09	0.84	0.27
264260003	8	0.26	0.10	0.55	0.15
262280005	10	1.43	0.27	2.74	0.89
263020001	9	0.29	0.16	0.85	0.22
263020004	9	0.41	0.17	0.73	0.21
264540002	7	0.27	0.11	0.49	0.15
260700002	9	0.20	0.07	0.43	0.11
263800002	7	0.39	0.11	0.75	0.22
261920002	9	0.42	0.08	0.66	0.21
264100001	7	0.23	0.16	0.30	0.06
262440001	7	0.31	0.13	0.52	0.14
264740001	5	0.10	0.03	0.14	0.04
263740001	9	0.34	0.16	0.57	0.15
262300001	4	0.26	0.16	0.41	0.11
264460005	4	0.27	0.12	0.63	0.24
263380003	2	0.50	0.40	0.61	0.15

PARAMETER: CADMIUM

METHOD: ATOMIC ABSORPTION
UNITS: MICROGRAMS/CUBIC METER

YEAR: 1972

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
262360002	11	0.010	0.006	0.019	0.003
261120003	4	0.008	0.003	0.020	0.008
262200004	7	0.054	0.010	0.140	0.051
262980001	9	0.141	0.004	1.170	0.386
261740001	8	0.007	0.000	0.020	0.006
262360001	3	0.027	0.000	0.050	0.025

PARAMETER: CADMIUM

METHOD: ATOMIC ABSORPTION
UNITS: MICROGRAMS/CUBIC METER

YEAR: 1973

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
262360002	20	0.020	0.006	0.043	0.011
261120003	25	0.011	0.000	0.025	0.007
262200004	30	0.211	0.005	3.500	0.630
262980001	36	0.013	0.001	0.030	0.006
261740001	34	0.218	0.000	7.070	1.211
262360001	10	0.012	0.004	0.020	0.005
261120002	4	0.006	0.001	0.015	0.006
264260002	1	0.002	0.002	0.002	
264260003	1	0.001	0.001	0.001	
262280005	11	0.831	0.007	6.812	1.998
263020001	6	0.011	0.003	0.021	0.008
263020004	6	0.008	0.004	0.012	0.003
264540002	1	0.003	0.003	0.003	
260700002	2	0.013	0.003	0.024	0.015
263800002	6	0.010	0.002	0.015	0.005
263800001	1	0.006	0.006	0.006	
261920002	4	0.008	0.003	0.015	0.005
264100001	3	0.011	0.006	0.020	0.008
262440001	3	0.010	0.003	0.018	0.008
264740001	3	0.005	0.001	0.008	0.004
263740001	5	0.010	0.008	0.012	0.002
263280001	10	0.015	0.010	0.020	0.005
264320001	1	0.029	0.029	0.029	
262760001	1	0.000	0.000	0.000	
262200006	1	0.010	0.010	0.010	

PARAMETER: CADMIUM

METHOD: ATOMIC ABSORPTION
UNITS: MICROGRAMS/CUBIC METER

YEAR: 1974

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
261120003	6	0.010	0.002	0.032	0.011
262200004	4	0.132	0.073	0.208	0.056
262980001	9	0.015	0.001	0.068	0.020
261740001	8	0.015	0.002	0.063	0.020
262360001	9	0.010	0.003	0.019	0.005
261120002	8	0.012	0.002	0.053	0.017
264260002	8	0.008	0.004	0.015	0.004
264260003	8	0.009	0.004	0.014	0.004
262280005	10	0.135	0.018	0.398	0.146
263020001	9	0.009	0.002	0.020	0.006
263020004	9	0.014	0.001	0.055	0.017
264540002	7	0.009	0.003	0.016	0.004
260700002	9	0.006	0.002	0.012	0.004
263800002	7	0.010	0.005	0.015	0.004
261920002	9	0.008	0.003	0.017	0.005
264100001	7	0.010	0.006	0.021	0.005
262440001	7	0.014	0.003	0.027	0.008
264740001	5	0.004	0.002	0.009	0.003
263740001	9	0.015	0.005	0.043	0.013
262300001	4	0.005	0.003	0.006	0.002
264460005	4	0.007	0.003	0.013	0.005
263380003	2	0.008	0.005	0.012	0.005

ST. LOUIS COUNTY DIVISION OF AIR POLLUTION CONTROL

SAROAD MONTHLY COMPOSITE DATA

PARAMETER: LEAD

METHOD: ATOMIC ABSORPTION
UNITS: MICROGRAMS/CUBIC METER

YEAR: 1971

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
262320001	12	2.310	1.010	4.540	1.154
264300003	12	0.670	0.260	1.850	0.477
260200001	12	1.495	0.790	3.550	0.781
261040002	12	2.846	1.000	6.810	1.521
262630002	12	1.236	0.570	2.610	0.633
260260001	12	1.752	0.460	5.340	1.608
262630003	12	1.006	0.187	2.640	0.684
260030001	6	2.625	0.840	5.110	1.425
264120001	6	2.172	1.080	4.270	1.117
260200002	5	2.480	1.650	4.220	1.101

PARAMETER: LEAD

METHOD: ATOMIC ABSORPTION
UNITS: MICROGRAMS/CUBIC METER

YEAR: 1972

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
262320001	12	1.52	0.36	2.34	0.51
264300003	12	0.40	0.12	0.64	0.19
260200001	12	0.90	0.43	1.96	0.44
261040002	12	1.68	0.76	3.08	0.72
262630002	12	0.87	0.50	1.92	0.40
260260001	12	0.94	0.48	2.50	0.52
262630003	10	0.85	0.28	2.79	0.70
260030001	12	1.35	0.70	2.56	0.55
264120001	11	1.03	0.62	2.19	0.44
260200002	12	0.86	0.48	1.70	0.39

PARAMETER: LEAD

METHOD: ATOMIC ABSORPTION
UNITS: MICROGRAMS/CUBIC METER

YEAR: 1973

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
262320001	12	1.24	0.77	2.02	0.36
264300003	11	0.43	0.10	0.66	0.24
260200001	11	1.05	0.65	1.72	0.38
261040002	9	2.06	1.13	3.71	1.01
262630002	12	0.71	0.46	1.01	0.17
260260001	12	0.72	0.37	1.33	0.27
262630003	10	0.62	0.21	1.01	0.28
260030001	12	1.29	0.71	2.07	0.40
264120001	12	0.88	0.44	1.86	0.38
260200002	11	0.78	0.38	1.59	0.37

PARAMETER: LEAD

METHOD: ATOMIC ABSORPTION
UNITS: MICROGRAMS/CUBIC METER

YEAR: 1974

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
262320001	4	1.56	0.76	2.90	1.02
264300003	7	0.39	0.20	0.74	0.18
260200001	10	0.85	0.50	1.77	0.42
261040002	5	2.06	0.76	4.03	1.52
262630002	7	0.73	0.38	1.31	0.32
260260001	9	0.93	0.27	2.75	0.81
262630003	7	0.79	0.43	1.55	0.41
260730001	7	1.19	0.50	3.00	0.87
264120001	10	0.94	0.46	2.07	0.58
260200002	9	0.92	0.31	2.88	0.80

PARAMETER: CADMIUM

METHOD: ATOMIC ABSORPTION
UNITS: MICROGRAMS/CUBIC METER

YEAR: 1971

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
262320001	12	0.0142	0.0000	0.0530	0.0164
264300003	12	0.0068	0.0000	0.0430	0.0119
260200001	12	0.0103	0.0000	0.0580	0.0161
261040002	12	0.0134	0.0000	0.0550	0.0179
262630002	12	0.0153	0.0000	0.0420	0.0137
262260001	12	0.0175	0.0000	0.1240	0.0356
262630003	12	0.0220	0.0000	0.1040	0.0284
260030001	6	0.0202	0.0060	0.0440	0.0155
264120001	6	0.0087	0.0030	0.0320	0.0115
260200002	5	0.0172	0.0040	0.0480	0.0192

PARAMETER: CADMIUM

METHOD: ATOMIC ABSORPTION
UNITS: MICROGRAMS/CUBIC METER

YEAR: 1972

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
262320001	12	0.005	0.000	0.013	0.005
264300003	12	0.003	0.000	0.014	0.004
260200001	12	0.004	0.000	0.011	0.003
261040002	12	0.007	0.000	0.049	0.014
262630002	12	0.016	0.001	0.076	0.022
260260001	12	0.009	0.001	0.067	0.019
262630003	10	0.012	0.000	0.077	0.024
260030001	12	0.010	0.000	0.063	0.018
264120001	11	0.006	0.000	0.049	0.014
260200002	12	0.005	0.000	0.020	0.006

PARAMETER: CADMIUM

METHOD: ATOMIC ABSORPTION
UNITS: MICROGRAMS/CUBIC METER

YEAR: 1973

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
262320001	12	0.003	0.000	0.012	0.004
264300003	11	0.004	0.000	0.010	0.003
260200001	11	0.001	0.000	0.005	0.002
261040002	9	0.007	0.000	0.036	0.011
262630002	12	0.007	0.000	0.018	0.005
260260001	12	0.003	0.000	0.010	0.003
262630003	10	0.004	0.000	0.013	0.004
260030001	12	0.004	0.000	0.017	0.005
264120001	12	0.006	0.001	0.018	0.005
260200002	11	0.004	0.000	0.017	0.005

PARAMETER: CADMIUM

METHOD: ATOMIC ABSORPTION
UNITS: MICROGRAMS/CUBIC METER

YEAR: 1974

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
262320001	4	0.002	0.000	0.010	0.005
264300003	7	0.003	0.000	0.007	0.003
260200001	10	0.004	0.000	0.021	0.007
261040002	5	0.003	0.000	0.007	0.003
262630002	7	0.013	0.000	0.090	0.032
260260001	9	0.003	0.000	0.012	0.005
262630003	7	0.004	0.000	0.011	0.004
260030001	7	0.002	0.000	0.007	0.003
264120001	10	0.002	0.000	0.009	0.003
260200002	9	0.005	0.000	0.019	0.007

ST. LOUIS CITY DIVISION OF AIR POLLUTION CONTROL

SAROAD MONTHLY COMPOSITE DATA

PARAMETER: LEAD

METHOD: ATOMIC ABSORPTION
UNITS: MICROGRAMS/CUBIC METER

YEAR: 1971

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
264280061	12	6.9	1.5	13.0	3.1
264280007	18	1.6	0.5	4.1	1.2
264280010	10	2.0	0.9	4.9	1.4
264280012	12	1.6	0.6	5.8	1.4
264280006	10	1.5	0.9	2.2	0.4
264280063	12	1.0	0.3	2.2	0.5
264280025	12	1.3	0.8	2.5	0.5
264280015	12	1.9	0.9	4.1	1.1

PARAMETER: LEAD

METHOD: ATOMIC ABSORPTION
UNITS: MICROGRAMS/CUBIC METER

YEAR: 1972

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
264280061	23	3.3	0.7	8.8	2.3
264280007	12	1.2	0.5	3.6	0.8
264280010	12	1.1	0.5	1.6	0.4
264280012	12	1.0	0.2	2.6	0.6
264280006	11	1.2	0.9	1.6	0.2
264280063	12	0.9	0.3	2.6	0.7
264280025	12	1.5	0.7	2.1	0.4
264280015	9	1.6	0.7	2.6	0.6

PARAMETER: LEAD

METHOD: ATOMIC ABSORPTION
UNITS: MICROGRAMS/CUBIC METER

YEAR: 1973

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
264280061	22	3.4	0.8	9.6	2.0
264280007	10	1.0	0.5	1.4	0.3
264280010	12	1.1	0.6	1.5	0.3
264280012	11	0.7	0.3	1.1	0.3
264280006	17	0.5	0.1	1.5	0.3
264280063	12	0.5	0.2	0.9	0.2
264280025	11	1.3	0.8	1.8	0.3
264280015	12	1.2	0.7	2.1	0.4

PARAMETER: CADMIUM

METHOD: ATOMIC ABSORPTION
UNITS: MICROGRAMS/CUBIC METER

YEAR: 1971

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
264280061	9	0.021	0.004	0.053	0.016
264280007	11	0.027	0.010	0.110	0.031
264280010	6	0.024	0.007	0.069	0.023
264280012	12	0.027	0.006	0.070	0.020
264280006	10	0.018	0.010	0.026	0.006
264280063	12	0.009	0.002	0.019	0.006
264280025	12	0.009	0.001	0.019	0.006
264280015	12	0.023	0.005	0.113	0.030

PARAMETER: CADMIUM

METHOD: ATOMIC ABSORPTION
UNITS: MICROGRAMS/CUBIC METER

YEAR: 1972

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
264280061	23	0.014	0.001	0.039	0.011
264280007	12	0.016	0.003	0.069	0.020
264280010	12	0.013	0.004	0.049	0.013
264280012	12	0.017	0.005	0.083	0.022
264280006	11	0.016	0.005	0.044	0.013
264280063	12	0.015	0.005	0.039	0.011
264280025	12	0.018	0.005	0.069	0.018
264280015	9	0.012	0.001	0.036	0.012

PARAMETER: CADMIUM

METHOD: ATOMIC ABSORPTION
UNITS: MICROGRAMS/CUBIC METER

YEAR: 1973

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
264280061	22	0.006	0.001	0.016	0.003
264280007	10	0.004	0.001	0.005	0.002
264280010	12	0.011	0.005	0.024	0.007
264280012	11	0.002	0.001	0.005	0.002
264280006	17	0.015	0.001	0.069	0.017
264280063	12	0.005	0.005	0.005	0.000
264280025	11	0.014	0.004	0.021	0.006
264280015	12	0.005	0.005	0.005	0.000

PARAMETER: CHROMIUM

METHOD: ATOMIC ABSORPTION
UNITS: MICROGRAMS/CUBIC METER

YEAR: 1972

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
264280006	1	0.003	0.003	0.003	

PARAMETER: CHROMIUM

METHOD: ATOMIC ABSORPTION
UNITS: MICROGRAMS/CUBIC METER

YEAR: 1973

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
264280061	22	0.002	0.001	0.016	0.003
264280007	10	0.016	0.007	0.032	0.007
264280010	12	0.001	0.001	0.001	0.000
264280012	11	0.010	0.001	0.057	0.016
264280006	17	0.008	0.001	0.100	0.024
264280063	12	0.001	0.001	0.001	0.000
264280025	11	0.006	0.001	0.015	0.004
264280015	12	0.001	0.001	0.001	0.000

ST. LOUIS CITY DIVISION OF AIR POLLUTION CONTROL

SAROAD QUARTERLY COMPOSITE DATA

PARAMETER: CHROMIUM

METHOD: ATOMIC ABSORPTION
UNITS: MICROGRAMS/CUBIC METER

YEAR: 1971

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
264280061	2	0.086	0.013	0.160	0.104
264280007	3	0.004	0.001	0.009	0.005
264280010	3	0.020	0.002	0.046	0.023
264280012	4	0.010	0.001	0.030	0.014
264280006	2	0.010	0.001	0.019	0.013
264280063	4	0.005	0.003	0.010	0.003
264280025	4	0.007	0.001	0.012	0.005
264280015	2	0.012	0.004	0.020	0.011

PARAMETER: CHRCMIUM

METHOD: ATOMIC ABSORPTION
UNITS: MICROGRAMS/CUBIC METER

YEAR: 1972

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
264280061	7	0.006	0.001	0.016	0.006
264280007	3	0.005	0.001	0.007	0.003
264280010	4	0.005	0.001	0.011	0.005
264280012	4	0.001	0.001	0.002	0.001
264280006	2	0.006	0.004	0.008	0.003
264280063	4	0.005	0.005	0.007	0.001
264280025	4	0.001	0.001	0.001	0.000
264280015	4	0.009	0.005	0.013	0.004

GEORGIA DEPARTMENT OF NATURAL RESOURCES

ENVIRONMENTAL PROTECTION DIVISION

SAROAD MONTHLY COMPOSITE DATA

PARAMETER: LEAD

METHOD: ATOMIC ABSORPTION
UNITS: MICROGRAMS/CUBIC METER

YEAR: 1971

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
110220001	12	1.3	0.4	3.7	0.9
110040002	6	1.0	0.1	2.1	0.7
115220002	12	0.9	0.3	2.5	0.6
114500006	12	0.7	0.2	2.0	0.5
114400002	12	1.2	0.4	1.9	0.5
114380002	12	1.1	0.4	2.0	0.6
113440001	11	1.1	0.1	2.3	0.7
113340002	12	0.4	0.1	0.9	0.2
112280001	7	0.6	0.1	1.4	0.5
111280001	11	1.0	0.3	3.5	0.9
110600001	10	0.6	0.1	1.4	0.4

PARAMETER: LEAD

METHOD: ATOMIC ABSORPTION
UNITS: MICROGRAMS/CUBIC METER

YEAR: 1972

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
110220001	11	0.8	0.4	1.4	0.3
110160001	4	1.6	0.4	4.3	1.8
110040002	12	0.8	0.3	2.2	0.5
115220002	12	1.1	0.4	2.0	0.5
114500006	12	0.6	0.3	1.0	0.2
114400002	12	1.0	0.4	1.8	0.3
114380002	12	0.9	0.6	1.1	0.1
113440001	12	0.9	0.2	1.8	0.4
113340002	12	0.5	0.0	1.0	0.3
112280001	12	0.4	0.2	0.7	0.1
111280001	12	1.1	0.5	2.4	0.7
110600001	11	0.6	0.3	1.5	0.3

PARAMETER: LEAD

METHOD: ATOMIC ABSORPTION
UNITS: MICROGRAMS/CUBIC METER

YEAR: 1973

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
110220001	12	0.9	0.3	2.0	0.5
110160001	12	0.7	0.2	2.0	0.5
110040002	11	0.8	0.3	1.6	0.4
115220002	12	0.8	0.4	1.9	0.5
114500006	6	0.5	0.2	0.9	0.2
114500011	6	0.9	0.6	1.3	0.2
114400002	12	0.9	0.5	1.3	0.3
114380002	12	1.0	0.7	1.5	0.3
113440001	12	1.0	0.6	1.9	0.4
113340002	10	0.4	0.2	0.7	0.2
112280001	12	0.5	0.2	1.2	0.3
111280001	12	0.9	0.6	1.6	0.3
110600001	12	1.0	0.5	2.2	0.5

MICHIGAN DEPARTMENT OF NATURAL RESOURCES

DIVISION OF AIR POLLUTION CONTROL

SAROAD DAILY DATA

PARAMETER: CADMIUM

METHOD: ATOMIC ABSORPTION
UNITS: MICROGRAMS/CUBIC METER

YEAR: 1974

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
235260001	23	0.0005	0.0001	0.0034	0.0006
231820002	42	0.0006	0.0001	0.0028	0.0006

PARAMETER: BERYLLIUM

METHOD: ATOMIC ABSORPTION
UNITS: MICROGRAMS/CUBIC METER

YEAR: 1974

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
235260001	23	0.0001	0.0001	0.0001	0.0000
231820002	41	0.0001	0.0001	0.0001	0.0000

PARAMETER: LEAD

METHOD: ATOMIC ABSORPTION
UNITS: MICROGRAMS/CUBIC METER

YEAR: 1974

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
235260001	23	0.280	0.081	0.510	0.114
231820002	42	0.217	0.040	0.370	0.080

CONNECTICUT DEPARTMENT OF ENVIRONMENTAL PROTECTION

SAROAD QUARTERLY COMPOSITE DATA

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PARAMETER: CADMIUM

METHOD: ATOMIC ABSORPTION
UNITS: MICROGRAMS/CUBIC METER

YEAR: 1971

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
070008003	4	0.0537	0.0118	0.1204	0.0460
070060001	4	0.0052	0.0023	0.0082	0.0025
070070001	4	0.0026	0.0007	0.0042	0.0015
070250123	4	0.0030	0.0018	0.0052	0.0016
070260001	3	0.0043	0.0032	0.0057	0.0013
070260002	1	0.0059	0.0059	0.0059	
070330002	4	0.0026	0.0019	0.0036	0.0007
070330018	4	0.0029	0.0023	0.0037	0.0006
070330003	4	0.0027	0.0014	0.0048	0.0015
070330007	4	0.0028	0.0019	0.0037	0.0007
070330001	4	0.0023	0.0017	0.0028	0.0005
070350123	4	0.0035	0.0032	0.0039	0.0003
070420003	4	0.0030	0.0013	0.0040	0.0012
070420004	1	0.0052	0.0052	0.0052	
070510001	6	0.0017	0.0005	0.0041	0.0013
070540001	4	0.0028	0.0020	0.0036	0.0007
070540005	4	0.0255	0.0187	0.0356	0.0076
070540003	4	0.0033	0.0017	0.0058	0.0018
070540002	4	0.0039	0.0022	0.0065	0.0019
070540006	4	0.0075	0.0030	0.0204	0.0086
070570003	4	0.0033	0.0023	0.0042	0.0007
070570001	4	0.0047	0.0007	0.0101	0.0042
070590002	4	0.0043	0.0017	0.0076	0.0026
070590036	4	0.0029	0.0014	0.0055	0.0018
070590001	4	0.0036	0.0016	0.0053	0.0016
070[illegible]78001	4	0.0013	0.0006	0.0017	0.0005
070660001	4	0.0051	0.0018	0.0113	0.0042
070680012	4	0.0044	0.0031	0.0074	0.0020
070680003	4	0.0028	0.0007	0.0052	0.0020
070680005	4	0.0028	0.0016	0.0045	0.0011
070680004	4	0.0020	0.0015	0.0023	0.0004
070700002	2	0.0052	0.0038	0.0066	0.0020
070700019	1	0.0034	0.0034	0.0034	
070700011	1	0.0058	0.0058	0.0058	
070702002	4	0.0039	0.0022	0.0062	0.0020
070700005	1	0.0098	0.0098	0.0098	
070820001	4	0.0027	0.0017	0.0040	0.0011
070820015	4	0.0020	0.0016	0.0023	0.0003
070840001	4	0.0015	0.0008	0.0020	0.0006
070855003	4	0.0025	0.0014	0.0041	0.0014
070900002	4	0.0036	0.0022	0.0061	0.0017
071030004	4	0.0027	0.0025	0.0030	0.0002
071060001	4	0.0027	0.0018	0.0036	0.0007
071110001	4	0.0043	0.0025	0.0074	0.0023
071110002	3	0.0052	0.0016	0.0178	0.0049
071130003	4	0.0039	0.0021	0.0057	0.0015
071160001	4	0.0033	0.0017	0.0043	0.0011
071240003	4	0.0642	0.0057	0.2384	0.1162
071460001	4	0.0013	0.0006	0.0025	0.0009

PARAMETER: CADMIUM

METHOD: ATOMIC ABSORPTION
UNITS: MICROGRAMS/CUBIC METER

YEAR: 1972

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
070008003	4	0.0134	0.0034	0.0232	0.0086
070060002	2	0.0651	0.0028	0.1275	0.0882
070060001	4	0.0078	0.0052	0.0100	0.0025
070070001	4	0.0185	0.0015	0.0326	0.0128
070175123	1	0.0025	0.0025	0.0025	
070250123	4	0.0023	0.0005	0.0046	0.0017
070260001	2	0.0035	0.0021	0.0050	0.0021
070260002	2	0.0043	0.0026	0.0060	0.0024
070330002	4	0.0040	0.0024	0.0053	0.0015
070330006	4	0.0033	0.0021	0.0041	0.0009
070330003	4	0.0038	0.0028	0.0045	0.0007
070330007	4	0.0036	0.0025	0.0050	0.0010
070330001	4	0.0034	0.0028	0.0048	0.0008
070350123	4	0.0022	0.0017	0.0026	0.0004
070420003	4	0.0036	0.0027	0.0063	0.0017
070420004	4	0.0037	0.0012	0.0063	0.0022
070510001	4	0.0045	0.0023	0.0065	0.0021
070540001	4	0.0035	0.0026	0.0043	0.0009
070540005	4	0.0134	0.0021	0.0210	0.0087
070540003	4	0.0042	0.0029	0.0051	0.0010
070540002	4	0.0046	0.0033	0.0053	0.0009
070540006	4	0.0052	0.0029	0.0103	0.0034
070570002	4	0.0043	0.0016	0.0062	0.0020
070570001	4	0.0048	0.0025	0.0070	0.0020
070570004	1	0.0017	0.0017	0.0017	
070590002	4	0.0046	0.0037	0.0055	0.0010
070590006	4	0.0048	0.0017	0.0069	0.0022
070590001	4	0.0036	0.0029	0.0041	0.0005
070478001	4	0.0032	0.0016	0.0054	0.0016
070660001	4	0.0069	0.0029	0.0134	0.0046
070680002	4	0.0047	0.0036	0.0059	0.0010
070680003	4	0.0038	0.0021	0.0053	0.0015
070680005	4	0.0035	0.0023	0.0052	0.0012
070680004	4	0.0035	0.0032	0.0046	0.0006
070700003	4	0.0053	0.0026	0.0104	0.0035
070700004	4	0.0038	0.0026	0.0050	0.0010
070700001	3	0.0032	0.0024	0.0047	0.0013
070700002	4	0.0051	0.0035	0.0072	0.0018
070700015	4	0.0053	0.0032	0.0085	0.0024
070820001	4	0.0036	0.0019	0.0051	0.0013
070820005	4	0.0044	0.0028	0.0060	0.0013
070840001	4	0.0021	0.0016	0.0028	0.0005
070855003	4	0.0037	0.0013	0.0058	0.0018
070970002	4	0.0018	0.0009	0.0023	0.0006
071080004	4	0.0046	0.0018	0.0075	0.0032
071080001	4	0.0055	0.0035	0.0065	0.0014
071110001	4	0.0034	0.0013	0.0066	0.0023
071130003	4	0.0049	0.0034	0.0083	0.0023
071160001	4	0.0029	0.0017	0.0040	0.0010

PARAMETER: CADMIUM

METHOD: ATOMIC ABSORPTION
UNITS: MICROGRAMS/CUBIC METER

YEAR: 1972

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
071240003	4	0.0223	0.0049	0.0714	0.0327
071460001	4	0.0019	0.0012	0.0027	0.0007

PARAMETER: CADMIUM

METHOD: ATOMIC ABSORPTION
UNITS: MICROGRAMS/CUBIC METER

YEAR: 1973

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
070008003	4	0.0085	0.0062	0.0134	0.0033
070028001	4	0.0019	0.0008	0.0024	0.0008
070060002	4	0.0246	0.0072	0.0354	0.0121
070060001	3	0.0059	0.0029	0.0093	0.0032
070070001	4	0.0317	0.0095	0.0516	0.0225
070085001	3	0.0036	0.0016	0.0067	0.0027
070175123	4	0.0030	0.0015	0.0038	0.0011
070250123	4	0.0023	0.0010	0.0032	0.0010
070260001	1	0.0021	0.0021	0.0021	
070330004	4	0.0031	0.0019	0.0060	0.0020
070330002	4	0.0036	0.0017	0.0047	0.0014
070330008	3	0.0035	0.0027	0.0050	0.0013
070330003	4	0.0044	0.0028	0.0058	0.0015
070330017	4	0.0042	0.0028	0.0050	0.0010
070330001	4	0.0034	0.0024	0.0051	0.0012
070350123	4	0.0016	0.0012	0.0021	0.0004
070420003	4	0.0021	0.0008	0.0041	0.0014
070420004	4	0.0041	0.0013	0.0074	0.0027
070510001	4	0.0028	0.0016	0.0044	0.0012
070540001	4	0.0059	0.0031	0.0095	0.0027
070540005	4	0.0044	0.0017	0.0072	0.0025
070540003	4	0.0026	0.0015	0.0040	0.0012
070540002	4	0.0042	0.0027	0.0065	0.0016
070540006	4	0.0035	0.0006	0.0070	0.0033
070570003	4	0.0026	0.0019	0.0030	0.0005
070570001	4	0.0033	0.0025	0.0051	0.0012
070570004	4	0.0009	0.0001	0.0021	0.0008
070590002	4	0.0032	0.0024	0.0041	0.0007
070590006	4	0.0032	0.0025	0.0040	0.0006
070590001	4	0.0025	0.0020	0.0031	0.0005
070478001	4	0.0018	0.0010	0.0028	0.0008
070660001	4	0.0029	0.0023	0.0037	0.0006
070630002	4	0.0034	0.0016	0.0053	0.0016
070680002	4	0.0029	0.0016	0.0051	0.0015
070680005	4	0.0025	0.0014	0.0032	0.0008
070630004	4	0.0035	0.0023	0.0051	0.0012
070700003	4	0.0024	0.0006	0.0055	0.0021
070700009	4	0.0019	0.0013	0.0025	0.0005
070700002	4	0.0017	0.0014	0.0020	0.0003
070700035	4	0.0033	0.0022	0.0041	0.0008
070820001	4	0.0027	0.0022	0.0030	0.0004
070820005	4	0.0029	0.0021	0.0042	0.0009
070840001	4	0.0019	0.0009	0.0028	0.0009
070855003	4	0.0024	0.0022	0.0034	0.0005
070900002	4	0.0017	0.0001	0.0035	0.0014
071080004	4	0.0054	0.0029	0.0082	0.0027
071080001	3	0.0040	0.0027	0.0063	0.0020
071110001	3	0.0031	0.0016	0.0054	0.0020
071110005	3	0.0012	0.0001	0.0027	0.0013

PARAMETER: CADMIUM

METHOD: ATOMIC ABSORPTION
UNITS: MICROGRAMS/CUBIC METER

YEAR: 1973

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
071130003	4	0.0024	0.0015	0.0039	0.0011
071160001	4	0.0021	0.0011	0.0037	0.0011
071240003	1	0.0046	0.0046	0.0046	
071460001	4	0.0009	0.0004	0.0015	0.0005
071205001	4	0.0008	0.0001	0.0012	0.0005

PARAMETER: LEAD

METHOD: ATOMIC ABSORPTION
UNITS: MICROGRAMS/CUBIC METER

YEAR: 1971

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SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
070008002	4	1.760	0.940	2.630	0.696
070060001	4	1.467	0.630	2.650	0.880
070070001	4	0.560	0.101	1.470	0.617
070250123	4	1.970	0.510	4.650	1.856
070260001	3	0.290	0.120	0.470	0.175
070260002	1	0.280	0.280	0.280	
070330002	4	1.650	0.750	3.050	1.016
070330008	4	1.642	0.610	2.690	0.963
070330003	4	1.290	0.770	1.980	0.569
070330007	4	0.830	0.410	1.260	0.382
070330011	4	1.125	0.170	2.540	1.044
070350123	4	2.080	1.100	4.310	1.496
070420003	4	1.847	0.550	3.850	1.407
070420004	1	1.390	1.390	1.390	
070510001	6	0.493	0.180	0.760	0.211
070540001	4	1.090	0.370	2.090	0.721
070540005	4	1.877	0.770	3.610	1.392
070540003	4	1.295	0.490	2.170	0.688
070540002	4	1.737	0.970	2.990	0.910
070540006	4	0.937	0.390	1.440	0.535
070570003	4	1.622	0.930	3.020	0.971
070570001	4	0.395	0.220	0.590	0.192
070590002	4	1.260	0.480	2.410	0.817
070590016	4	0.642	0.200	1.460	0.576
070590001	4	0.957	0.250	2.350	0.944
070478001	4	0.395	0.250	0.580	0.166
070660001	4	1.515	0.630	2.800	0.932
070680002	4	2.142	0.840	3.880	1.329
070680003	4	1.935	0.620	3.350	1.477
070680005	4	1.165	0.310	1.990	0.688
070680004	4	1.037	0.310	1.650	0.714
070700003	2	1.125	0.460	1.790	0.940
070700009	1	2.900	2.900	2.900	
070700001	1	3.160	3.160	3.160	
070700002	4	1.372	0.440	2.360	0.875
070700005	1	2.610	2.610	2.610	
070820001	4	1.102	0.360	2.300	0.835
070820005	4	1.332	0.590	2.410	0.812
070840001	4	0.940	0.410	1.870	0.639
070855003	4	0.525	0.290	0.730	0.228
070900012	4	0.850	0.160	2.020	0.808
071080004	4	1.047	0.390	2.290	0.850
071080001	4	1.282	0.690	2.770	0.953
071110001	4	0.925	0.160	2.680	1.306
071110002	4	1.443	0.580	3.140	1.469
071130003	4	0.842	0.410	1.720	0.583
071160001	4	1.235	0.430	2.320	0.846
071240003	4	1.297	0.470	2.810	1.055
071400001	4	0.750	0.320	1.150	0.339

PARAMETER: LEAD

METHOD: ATOMIC ABSORPTION
UNITS: MICROGRAMS/CUBIC METER

YEAR: 1972

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
070008003	4	1.6575	1.2200	2.3200	0.5151
070060002	2	3.3300	0.8700	5.7900	3.4790
070060001	4	1.4525	1.1100	1.9200	0.3400
070070001	4	0.9925	0.7400	1.3000	0.2462
070175123	1	1.0300	1.0300	1.0300	
070250123	4	1.5500	0.8900	2.8100	0.8573
070260001	2	0.4400	0.4100	0.4700	0.0424
070260002	2	0.5750	0.5200	0.6300	0.0778
070330002	4	1.8225	1.3900	2.6000	0.5401
070330008	4	1.4750	1.2200	1.8800	0.3023
070330003	4	1.7025	1.5900	1.9500	0.1664
070330007	4	0.9725	0.5500	1.8600	0.5993
070330001	4	1.5125	1.1700	1.8600	0.3072
070350123	4	0.8050	0.6200	1.0000	0.1561
070420003	4	1.9725	1.4000	2.5700	0.5527
070420004	4	1.4775	0.5700	2.1800	0.6984
070510001	4	1.0664	0.0056	2.0300	0.9111
070540001	4	1.9675	1.0300	2.2200	0.6265
070540005	4	1.0900	0.5400	1.7800	0.5150
070540003	4	1.6250	0.9900	2.1900	0.5354
070540002	4	1.6125	1.4200	1.8700	0.1960
070540006	4	1.3925	0.9600	2.1800	0.5393
070570003	4	1.6875	1.0300	2.3600	0.5452
070570001	4	0.8175	0.6500	1.0500	0.1882
070570004	1	0.4700	0.4700	0.4700	
070590002	4	1.2200	0.9100	1.5400	0.2645
070590006	4	0.8475	0.6000	1.0800	0.2291
070590001	4	0.9100	0.8000	1.0200	0.0931
070476001	4	0.5450	0.3200	0.6600	0.1546
070660001	4	1.8850	1.0500	2.4600	0.6226
070680002	4	1.8350	1.1700	2.7100	0.6535
070680003	4	2.1800	1.2200	3.1800	0.8139
070680005	4	1.0575	0.6400	1.6600	0.4505
070680004	4	1.0675	0.7700	1.3400	0.2724
070700003	4	0.8600	0.6600	1.0300	0.1525
070700009	4	1.0675	1.0000	1.1200	0.0499
070700001	3	0.9833	0.5300	1.4500	0.4751
070700002	4	1.6875	1.2100	2.7000	0.6822
070700005	4	1.2775	0.9000	1.4800	0.2740
070820001	4	1.5150	1.2900	1.7500	0.1895
070820005	4	1.5825	1.1500	1.9200	0.3195
070840001	4	1.0900	0.7400	1.2500	0.2357
070855003	4	0.9375	0.6500	1.1600	0.2367
070900002	4	0.7800	0.6600	0.9300	0.1314
071050004	4	1.6925	1.1000	2.4600	0.6712
071040001	4	2.4425	1.3400	3.0200	0.4849
071110001	4	0.8200	0.5500	1.0900	0.3061
071130003	4	1.1475	0.7500	1.8300	0.4720
071150001	4	1.5925	1.0400	1.9700	0.4115

PARAMETER: LEAD

METHOD: ATOMIC ABSORPTION
UNITS: MICROGRAMS/CUBIC METER

YEAR: 1972

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
071240003	4	1.7400	1.3100	2.2300	0.4048
071460001	4	0.8350	0.2400	1.1100	0.4078

PARAMETER: LEAD

METHOD: ATOMIC ABSORPTION
UNITS: MICROGRAMS/CUBIC METER

YEAR: 1973

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
070008003	4	1.3350	0.9200	1.6700	0.3157
070028001	4	0.5425	0.3700	0.7100	0.1417
070060002	4	1.4275	0.9600	1.7400	0.3784
070060001	3	1.2200	0.9100	1.4500	0.2788
070070001	4	1.0175	0.6800	1.3300	0.3208
070085001	3	0.4500	0.2700	0.5800	0.1609
070175123	4	1.0375	0.5800	1.3500	0.3397
070250123	4	1.0475	0.5500	1.5700	0.4332
070260001	1	0.3500	0.3500	0.3500	
070330004	4	0.4825	0.0900	0.7700	0.3257
070330002	4	1.4275	0.7500	1.9700	0.5049
070330006	3	1.3267	1.0600	1.7000	0.3331
070330003	4	1.3550	1.1300	1.6700	0.3469
070330007	4	0.6400	0.4800	0.8500	0.1627
070330001	4	1.0125	0.5500	1.4900	0.3844
070350123	4	0.7750	0.3600	0.9900	0.2827
070420003	4	1.2075	0.9000	1.4900	0.3108
070420004	4	1.1425	0.6400	1.9600	0.6242
070510001	4	0.7000	0.2900	1.2000	0.3769
070540001	4	3.3550	1.1100	8.1500	3.2500
070540005	4	1.3100	0.5600	1.8900	0.6350
070540003	4	1.4275	0.9600	1.7500	0.3711
070540002	4	1.3975	0.9300	1.7700	0.3755
070540006	4	1.1075	0.4300	2.8300	1.1538
070570003	4	1.2100	0.7400	1.6300	0.4557
070570001	4	0.8300	0.6600	0.9400	0.1206
070570004	4	0.4075	0.3100	0.5300	0.1097
070590002	4	1.0325	0.6300	1.3300	0.3217
070590006	4	0.6925	0.4100	0.9200	0.2665
070590001	4	0.8575	0.3600	1.2800	0.4917
070478001	4	0.5100	0.3200	0.7300	0.1683
070660001	4	1.4350	0.9400	1.6600	0.3352
070680002	4	1.5850	0.3800	2.4100	0.6285
070680003	4	1.7500	0.9900	2.2200	0.5306
070680005	4	1.0725	0.7300	1.6800	0.4265
070680004	4	1.1525	0.7000	1.6100	0.4127
070700003	4	0.8325	0.3800	1.5500	0.5385
070700009	4	0.9425	0.5100	1.2700	0.3831
070700002	4	1.6050	0.8900	2.8200	0.8990
070700005	4	1.0750	0.7200	1.5500	0.3742
070820001	4	1.4275	0.9300	2.1300	0.5658
070820005	4	1.3225	0.8100	1.7000	0.3788
070840001	4	1.0800	0.7100	1.4300	0.3032
070855003	4	0.8025	0.6000	0.9600	0.1721
070900002	4	0.6800	0.3700	0.8800	0.2180
071060004	4	1.7925	0.8400	2.1700	0.6398
071060001	3	1.6933	0.9700	2.1500	0.6336
071110001	3	0.6200	0.4500	0.7700	0.1609
071110005	3	0.7533	0.1400	1.2700	0.5712

PARAMETER: LEAD

METHOD: ATOMIC ABSORPTION
UNITS: MICROGRAMS/CUBIC METER

YEAR: 1973

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
071130003	4	0.7150	0.2300	0.9700	0.3467
071160001	4	1.0650	0.8200	1.2000	0.1725
071240003	1	1.6300	1.6300	1.6300	
071460001	4	0.7350	0.4400	0.9800	0.2277
071205001	4	0.1650	0.0001	0.3200	0.1310

PARAMETER: CHROMIUM

METHOD: ATOMIC ABSORPTION
UNITS: MICROGRAMS/CUBIC METER

YEAR: 1971

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
070008003	4	0.0092	0.0030	0.0200	0.0075
070060001	4	0.0077	0.0040	0.0160	0.0056
070070001	4	0.0067	0.0030	0.0100	0.0033
070250123	4	0.0072	0.0040	0.0100	0.0025
070260001	3	0.0113	0.0040	0.0210	0.0087
070260002	1	0.0190	0.0190	0.0190	
070330002	4	0.0135	0.0040	0.0280	0.0110
070330008	4	0.0115	0.0060	0.0240	0.0085
070330003	4	0.0067	0.0030	0.0110	0.0035
070330007	4	0.0095	0.0010	0.0220	0.0093
070330001	4	0.0063	0.0001	0.0110	0.0051
070350123	4	0.0222	0.0050	0.0350	0.0147
070420003	4	0.0135	0.0080	0.0240	0.0071
070420004	1	0.0200	0.0200	0.0200	
070510001	6	0.0127	0.0050	0.0360	0.0117
070540001	4	0.0102	0.0010	0.0290	0.0127
070540005	4	0.0222	0.0040	0.0580	0.0248
070540003	4	0.0170	0.0040	0.0450	0.0194
070540002	4	0.0165	0.0050	0.0450	0.0191
070540006	4	0.0200	0.0040	0.0470	0.0194
070570003	4	0.0112	0.0030	0.0340	0.0152
070570001	4	0.0068	0.0001	0.0220	0.0103
070590002	4	0.0070	0.0030	0.0170	0.0067
070590006	4	0.0090	0.0030	0.0270	0.0120
070590001	4	0.0078	0.0001	0.0220	0.0098
070478001	4	0.0072	0.0010	0.0210	0.0093
070660001	4	0.0127	0.0040	0.0390	0.0175
070680002	4	0.0127	0.0040	0.0320	0.0129
070680003	4	0.0090	0.0010	0.0250	0.0110
070680005	4	0.0067	0.0010	0.0170	0.0071
070680004	4	0.0065	0.0030	0.0170	0.0070
070700003	2	0.0035	0.0010	0.0060	0.0035
070700009	1	0.0010	0.0010	0.0010	
070700001	1	0.0040	0.0040	0.0040	
070700002	4	0.0107	0.0040	0.0280	0.0115
070700005	1	0.0040	0.0040	0.0040	
070820001	4	0.0060	0.0010	0.0150	0.0062
070820005	4	0.0110	0.0010	0.0350	0.0161
070840001	4	0.0107	0.0040	0.0240	0.0090
070855003	4	0.0072	0.0030	0.0150	0.0057
070900002	4	0.0125	0.0050	0.0210	0.0070
071080004	4	0.0095	0.0030	0.0260	0.0110
071080001	4	0.0073	0.0001	0.0210	0.0093
071110001	4	0.0077	0.0030	0.0150	0.0055
071110002	3	0.0143	0.0070	0.0270	0.0110
071130003	4	0.0095	0.0001	0.0290	0.0136
071160001	4	0.0097	0.0040	0.0220	0.0083
071240003	4	0.0195	0.0070	0.0340	0.0113
071460001	4	0.0105	0.0010	0.0320	0.0145

PARAMETER: CHROMIUM

METHOD: ATOMIC ABSORPTION
UNITS: MICROGRAMS/CUBIC METER

YEAR: 1972

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
070008003	4	0.0145	0.0060	0.0370	0.0151
070060002	2	0.0090	0.0001	0.0180	0.0127
070060001	4	0.0073	0.0001	0.0130	0.0054
070070001	4	0.0055	0.0040	0.0060	0.0010
070175123	1	0.0080	0.0080	0.0080	
070250123	4	0.0050	0.0001	0.0070	0.0033
070260001	2	0.0030	0.0001	0.0060	0.0042
070260012	2	0.0025	0.0001	0.0050	0.0035
070330002	4	0.0082	0.0050	0.0150	0.0046
070330006	4	0.0077	0.0067	0.0110	0.0024
070330003	4	0.0077	0.0040	0.0120	0.0035
070330007	4	0.0052	0.0040	0.0070	0.0015
070330001	4	0.0057	0.0040	0.0070	0.0013
070350123	4	0.0040	0.0001	0.0110	0.0052
070420003	4	0.0075	0.0040	0.0160	0.0057
070420004	4	0.0050	0.0001	0.0120	0.0051
070510001	4	0.0080	0.0001	0.0200	0.0085
070540001	4	0.0043	0.0001	0.0070	0.0031
070540005	4	0.0040	0.0001	0.0070	0.0029
070540003	4	0.0043	0.0001	0.0070	0.0031
070540002	4	0.0045	0.0001	0.0080	0.0034
070540006	4	0.0110	0.0040	0.0270	0.0107
070570003	4	0.0082	0.0070	0.0100	0.0013
070570001	4	0.0117	0.0100	0.0150	0.0022
070570004	1	0.0001	0.0001	0.0001	
070590002	4	0.0063	0.0001	0.0110	0.0046
070590006	4	0.0040	0.0001	0.0070	0.0029
070590001	4	0.0011	0.0001	0.0040	0.0020
070478001	4	0.0956	0.0001	0.3820	0.1910
070660001	4	0.0085	0.0050	0.0130	0.0034
070660002	4	0.0072	0.0060	0.0080	0.0010
070660003	4	0.0055	0.0040	0.0070	0.0013
070680005	4	0.0033	0.0001	0.0060	0.0025
070680004	4	0.0085	0.0060	0.0130	0.0033
070700003	4	0.0045	0.0001	0.0060	0.0030
070700009	4	0.0103	0.0001	0.0270	0.0116
070700001	3	0.0070	0.0040	0.0100	0.0030
070700002	4	0.0095	0.0050	0.0140	0.0052
070700005	4	0.0080	0.0050	0.0110	0.0026
070820001	4	0.0080	0.0060	0.0110	0.0022
070820005	4	0.0087	0.0070	0.0110	0.0017
070840001	4	0.0050	0.0001	0.0080	0.0035
070855003	4	0.0055	0.0001	0.0120	0.0050
070900002	4	0.0033	0.0001	0.0070	0.0037
071080004	4	0.0070	0.0001	0.0150	0.0062
071080001	4	0.0115	0.0060	0.0170	0.0049
071110001	4	0.0038	0.0001	0.0060	0.0026
071130003	4	0.0038	0.0001	0.0070	0.0029
071160001	4	0.0070	0.0030	0.0150	0.0054

PARAMETER: CHROMIUM

METHOD: ATOMIC ABSORPTION
UNITS: MICROGRAMS/CUBIC METER

YEAR: 1972

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
071240003	4	0.0115	0.0050	0.0210	0.0075
071460001	4	0.0039	0.0001	0.0060	0.0026

PARAMETER: CHROMIUM

METHOD: ATOMIC ABSORPTION
UNITS: MICROGRAMS/CUBIC METER

YEAR: 1973

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
070008003	4	0.0065	0.0040	0.0080	0.0017
070028001	3	0.0070	0.0040	0.0130	0.0052
070060002	4	0.0095	0.0050	0.0150	0.0042
070060001	3	0.0093	0.0080	0.0110	0.0015
070070001	4	0.0093	0.0001	0.0230	0.0097
070085001	3	0.0070	0.0040	0.0090	0.0026
070175123	4	0.0072	0.0040	0.0140	0.0046
070250123	4	0.0050	0.0001	0.0110	0.0045
070260001	1	0.0030	0.0030	0.0030	
070330004	4	0.0038	0.0001	0.0120	0.0056
070330002	4	0.0052	0.0040	0.0080	0.0019
070330006	3	0.0060	0.0040	0.0080	0.0020
070330003	4	0.0050	0.0040	0.0060	0.0012
070330007	4	0.0038	0.0001	0.0070	0.0033
070330001	4	0.0065	0.0040	0.0110	0.0031
070350123	4	0.0070	0.0040	0.0120	0.0036
070420003	4	0.0050	0.0030	0.0070	0.0018
070420004	4	0.0038	0.0001	0.0090	0.0037
070510001	4	0.0025	0.0001	0.0040	0.0017
070540001	4	0.0065	0.0040	0.0130	0.0044
070540005	4	0.0065	0.0040	0.0090	0.0021
070540003	4	0.0045	0.0030	0.0070	0.0017
070540002	4	0.0040	0.0030	0.0050	0.0008
070540006	4	0.0115	0.0001	0.0260	0.0108
070570003	4	0.0023	0.0001	0.0040	0.0017
070570001	4	0.0053	0.0001	0.0100	0.0042
070570004	4	0.0045	0.0001	0.0110	0.0046
070590002	4	0.0028	0.0001	0.0060	0.0025
070590006	4	0.0015	0.0001	0.0030	0.0017
070590001	4	0.0024	0.0001	0.0070	0.0032
070478001	4	0.0025	0.0001	0.0050	0.0020
070660001	4	0.0060	0.0040	0.0080	0.0023
070680002	4	0.0045	0.0001	0.0110	0.0046
070680003	4	0.0035	0.0001	0.0060	0.0025
070680005	4	0.0028	0.0001	0.0060	0.0031
070680004	4	0.0040	0.0030	0.0050	0.0008
070700003	4	0.0033	0.0001	0.0050	0.0023
070700009	4	0.0023	0.0001	0.0030	0.0015
070700002	4	0.0073	0.0001	0.0170	0.0071
070700005	4	0.0053	0.0001	0.0120	0.0051
070820001	4	0.0048	0.0001	0.0080	0.0034
070820005	4	0.0058	0.0001	0.0120	0.0049
070840001	4	0.0067	0.0020	0.0110	0.0044
070855003	4	0.0043	0.0001	0.0110	0.0047
070900002	4	0.0065	0.0020	0.0140	0.0053
071080004	4	0.0126	0.0040	0.0230	0.0091
071080001	3	0.0113	0.0060	0.0180	0.0061
071110001	3	0.0074	0.0001	0.0160	0.0080
071110005	3	0.0044	0.0001	0.0100	0.0051

PARAMETER: CHROMIUM

METHOD: ATOMIC ABSORPTION
UNITS: MICROGRAMS/CUBIC METER

YEAR: 1973

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
071130003	4	0.0043	0.0001	0.0140	0.0066
071160001	4	0.0095	0.0040	0.0240	0.0097
071240003	1	0.0200	0.0200	0.0200	
071460001	4	0.0070	0.0001	0.0150	0.0064
071205001	4	0.0045	0.0001	0.0140	0.0066

PARAMETER: BERYLLIUM

METHOD: ATOMIC ABSORPTION
UNITS: MICROGRAMS/CUBIC METER

YEAR: 1971

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SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
070308003	3	0.0000	0.0000	0.0000	0.0000
070060001	3	0.0000	0.0000	0.0000	0.0000
070070001	3	0.0000	0.0000	0.0000	0.0000
070250123	3	0.0000	0.0000	0.0000	0.0000
070260001	2	0.0000	0.0000	0.0000	0.0000
070260002	1	0.0000	0.0000	0.0000	
070330002	3	0.0000	0.0000	0.0000	0.0000
070330008	3	0.0000	0.0000	0.0000	0.0000
070330003	3	0.0000	0.0000	0.0000	0.0000
070330007	3	0.0000	0.0000	0.0000	0.0000
070330001	3	0.0000	0.0000	0.0000	0.0000
070350123	3	0.0000	0.0000	0.0000	0.0000
070420003	3	0.0000	0.0000	0.0000	0.0000
070420004	1	0.0000	0.0000	0.0000	
070510001	4	0.0000	0.0000	0.0000	0.0000
070540001	3	0.0000	0.0000	0.0000	0.0000
070540005	3	0.0000	0.0000	0.0000	0.0000
070540003	3	0.0000	0.0000	0.0000	0.0000
070540002	3	0.0000	0.0000	0.0000	0.0000
070540006	3	0.0000	0.0000	0.0000	0.0000
070570003	3	0.0000	0.0000	0.0000	0.0000
070570001	3	0.0000	0.0000	0.0000	0.0000
070590002	3	0.0000	0.0000	0.0000	0.0000
070590006	3	0.0000	0.0000	0.0000	0.0000
070590001	3	0.0000	0.0000	0.0000	0.0000
070478001	3	0.0000	0.0000	0.0000	0.0000
070660001	3	0.0000	0.0000	0.0000	0.0000
070660002	3	0.0000	0.0000	0.0000	0.0000
070680003	3	0.0000	0.0000	0.0000	0.0000
070680005	3	0.0000	0.0000	0.0000	0.0000
070680004	3	0.0000	0.0000	0.0000	0.0000
070700003	2	0.0000	0.0000	0.0000	0.0000
070700002	3	0.0000	0.0000	0.0000	0.0000
070820001	3	0.0000	0.0000	0.0000	0.0000
070820005	3	0.0000	0.0000	0.0000	0.0000
070840001	3	0.0000	0.0000	0.0000	0.0000
070850013	3	0.0000	0.0000	0.0000	0.0000
070900012	3	0.0000	0.0000	0.0000	0.0000
071080004	3	0.0000	0.0000	0.0000	0.0000
071090001	3	0.0000	0.0000	0.0000	0.0000
071110001	3	0.0000	0.0000	0.0000	0.0000
071110002	2	0.0000	0.0000	0.0000	0.0000
071130002	2	0.0000	0.0000	0.0000	0.0000
071160001	3	0.0000	0.0000	0.0000	0.0000
071240003	3	0.0000	0.0000	0.0000	0.0000
071460001	3	0.0000	0.0000	0.0000	0.0000

PARAMETER: BERYLLIUM

METHOD: ATOMIC ABSORPTION
UNITS: MICROGRAMS/CUBIC METER

YEAR: 1972

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
070008003	4	0.0000	0.0000	0.0000	0.0000
070060002	2	0.0002	0.0000	0.0004	0.0003
070060001	4	0.0000	0.0000	0.0000	0.0000
070070001	4	0.0000	0.0000	0.0000	0.0000
070175123	1	0.0000	0.0000	0.0000	
070250123	4	0.0000	0.0000	0.0000	0.0000
070260001	2	0.0000	0.0000	0.0000	0.0000
070260002	2	0.0000	0.0000	0.0000	0.0000
070330002	4	0.0001	0.0000	0.0005	0.0003
070330008	4	0.0001	0.0000	0.0004	0.0002
070330003	4	0.0000	0.0000	0.0000	0.0000
070330007	4	0.0000	0.0000	0.0000	0.0000
070330001	4	0.0000	0.0000	0.0000	0.0000
070350123	4	0.0000	0.0000	0.0000	0.0000
070420003	4	0.0000	0.0000	0.0000	0.0000
070420004	4	0.0000	0.0000	0.0000	0.0000
070510001	4	0.0001	0.0000	0.0004	0.0002
070540001	4	0.0000	0.0000	0.0000	0.0000
070540015	4	0.0004	0.0000	0.0018	0.0009
070540003	4	0.0000	0.0000	0.0000	0.0000
070540002	4	0.0001	0.0000	0.0005	0.0003
070540006	4	0.0000	0.0000	0.0000	0.0000
070570003	4	0.0000	0.0000	0.0000	0.0000
070570001	4	0.0000	0.0000	0.0000	0.0000
070570004	1	0.0000	0.0000	0.0000	
070590002	4	0.0000	0.0000	0.0000	0.0000
070590006	4	0.0000	0.0000	0.0000	0.0000
070590001	4	0.0000	0.0000	0.0000	0.0000
070478001	4	0.0000	0.0000	0.0000	0.0000
070660001	4	0.0000	0.0000	0.0000	0.0000
070680002	4	0.0000	0.0000	0.0000	0.0000
070680003	4	0.0000	0.0000	0.0000	0.0000
070680005	4	0.0001	0.0000	0.0004	0.0002
070680004	4	0.0001	0.0000	0.0004	0.0002
070700003	4	0.0000	0.0000	0.0000	0.0000
070700004	4	0.0001	0.0000	0.0004	0.0002
070700001	3	0.0000	0.0000	0.0000	0.0000
070700002	4	0.0000	0.0000	0.0000	0.0000
070700005	4	0.0001	0.0000	0.0003	0.0001
070820001	4	0.0001	0.0000	0.0004	0.0002
070820005	4	0.0000	0.0000	0.0000	0.0000
070840001	4	0.0000	0.0000	0.0000	0.0000
070855003	4	0.0000	0.0000	0.0000	0.0000
070900002	4	0.0000	0.0000	0.0000	0.0000
071080004	4	0.0000	0.0000	0.0000	0.0000
071080001	4	0.0000	0.0000	0.0000	0.0000
071110001	4	0.0001	0.0000	0.0004	0.0002
071130003	4	0.0000	0.0000	0.0000	0.0000
071160001	4	0.0000	0.0000	0.0000	0.0000

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                    PARAMETER: BERYLLIUM

                       METHOD: ATOMIC ABSORPTION
                        UNITS: MICROGRAMS/CUBIC METER

                         YEAR: 1972

                 NUMBER OF                                          STANDARD
     SITE         SAMPLES    AVERAGE      MINIMUM     MAXIMUM  DEVIATION

   071240003            4     0.0000       0.0000      0.0000     0.0000
   071460001            4     0.0000       0.0000      0.0000     0.0000
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PARAMETER: BERYLLIUM

METHOD: ATOMIC ABSORPTION
UNITS: MICROGRAMS/CUBIC METER

YEAR: 1973

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
070008003	4	0.0000	0.0000	0.0000	0.0000
070028001	4	0.0000	0.0000	0.0000	0.0000
070060002	4	0.0000	0.0000	0.0002	0.0001
070060001	3	0.0001	0.0000	0.0003	0.0002
070070001	4	0.0000	0.0000	0.0002	0.0001
070085001	3	0.0000	0.0000	0.0000	0.0000
070175123	4	0.0000	0.0000	0.0000	0.0000
070250123	4	0.0000	0.0000	0.0000	0.0000
070260001	1	0.0002	0.0002	0.0002	
070330004	4	0.0001	0.0000	0.0003	0.0001
070330002	4	0.0001	0.0000	0.0004	0.0002
070330008	3	0.0001	0.0000	0.0004	0.0002
070330003	4	0.0001	0.0000	0.0005	0.0003
070330007	4	0.0001	0.0000	0.0003	0.0001
070330001	4	0.0001	0.0000	0.0003	0.0001
070350123	4	0.0001	0.0000	0.0005	0.0003
070420003	4	0.0000	0.0000	0.0000	0.0000
070420004	4	0.0001	0.0000	0.0005	0.0003
070510001	4	0.0001	0.0000	0.0005	0.0003
070540001	4	0.0000	0.0000	0.0000	0.0000
070540005	4	0.0000	0.0000	0.0000	0.0000
070540003	4	0.0000	0.0000	0.0000	0.0000
070540002	4	0.0000	0.0000	0.0000	0.0000
070540006	4	0.0000	0.0000	0.0000	0.0000
070570003	4	0.0000	0.0000	0.0000	0.0000
070570001	4	0.0000	0.0000	0.0000	0.0000
070570004	4	0.0000	0.0000	0.0000	0.0000
070590002	4	0.0000	0.0000	0.0000	0.0000
070590006	4	0.0000	0.0000	0.0000	0.0000
070590001	4	0.0000	0.0000	0.0000	0.0000
070478001	4	0.0000	0.0000	0.0000	0.0000
070660001	4	0.0000	0.0000	0.0000	0.0000
070680002	4	0.0000	0.0000	0.0000	0.0000
070680003	4	0.0000	0.0000	0.0000	0.0000
070680005	4	0.0000	0.0000	0.0000	0.0000
070680004	4	0.0001	0.0000	0.0004	0.0002
070700003	4	0.0000	0.0000	0.0002	0.0001
070700009	4	0.0000	0.0000	0.0000	0.0000
070700002	4	0.0000	0.0000	0.0000	0.0000
070700005	4	0.0000	0.0000	0.0000	0.0000
070820001	4	0.0000	0.0000	0.0000	0.0000
070820005	4	0.0000	0.0000	0.0000	0.0000
070340001	4	0.0000	0.0000	0.0002	0.0001
070855003	4	0.0000	0.0000	0.0000	0.0000
070900002	4	0.0000	0.0000	0.0000	0.0000
071080004	4	0.0000	0.0000	0.0000	0.0000
071080001	3	0.0000	0.0000	0.0000	0.0000
071110001	3	0.0000	0.0000	0.0000	0.0000
071110005	3	0.0000	0.0000	0.0000	0.0000

PARAMETER: BERYLLIUM

METHOD: ATOMIC ABSORPTION
UNITS: MICROGRAMS/CUBIC METER

YEAR: 1973

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
071130003	4	0.0000	0.0000	0.0000	0.0000
071160001	4	0.0000	0.0000	0.0000	0.0000
071240003	1	0.0000	0.0000	0.0000	
071460001	4	0.0000	0.0000	0.0000	0.0000
071205001	4	0.0000	0.0000	0.0000	0.0000

TENNESSEE DEPARTMENT OF PUBLIC HEALTH

DIVISION OF AIR POLLUTION CONTROL

SAROAD MONTHLY DATA

PARAMETER: ARSENIC

METHOD: ATOMIC ABSORPTION
UNITS: MICROGRAMS/CUBIC METER

YEAR: 1972

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
442220001	1	0.262	0.262	0.262	
442520001	1	0.262	0.262	0.262	

PARAMETER: ARSENIC

METHOD: ATOMIC ABSORPTION
UNITS: MICROGRAMS/CUBIC METER

YEAR: 1973

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
442740001	2	0.262	0.262	0.262	0.000
442220001	2	0.262	0.262	0.262	0.000
441700001	3	0.262	0.262	0.262	0.000
442480002	2	0.262	0.262	0.262	0.000
441700002	2	0.262	0.262	0.262	0.000
442920002	2	0.262	0.262	0.262	0.000
440060001	1	0.262	0.262	0.262	
440500002	1	0.262	0.262	0.262	
440500001	1	0.262	0.262	0.262	

PARAMETER: BERYLLIUM

METHOD: ATOMIC ABSORPTION
UNITS: MICROGRAMS/CUBIC METER

YEAR: 1972

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
442220001	1	0.004	0.004	0.004	
442520001	1	0.004	0.004	0.004	

PARAMETER: BERYLLIUM

METHOD: ATOMIC ABSORPTION
UNITS: MICROGRAMS/CUBIC METER

YEAR: 1973

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
442740001	11	0.002	0.002	0.004	0.001
442220001	11	0.002	0.002	0.004	0.001
441700001	12	0.002	0.002	0.004	0.001
442280001	4	0.002	0.002	0.002	0.000
442480001	1	0.002	0.002	0.002	
442480002	10	0.002	0.002	0.004	0.001
441700002	14	0.002	0.002	0.004	0.001
443440001	8	0.002	0.002	0.002	0.000
443440002	5	0.002	0.002	0.002	0.000
442920002	11	0.002	0.002	0.004	0.001
440580002	7	0.002	0.002	0.002	0.000
440060001	1	0.004	0.004	0.004	
440500002	1	0.004	0.004	0.004	
440500001	1	0.004	0.004	0.004	

PARAMETER: BERYLLIUM

METHOD: ATOMIC ABSORPTION
UNITS: MICROGRAMS/CUBIC METER

YEAR: 1974

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
442740001	7	0.002	0.002	0.002	0.000
442220001	3	0.002	0.002	0.002	0.000
441700001	8	0.002	0.002	0.002	0.000
442480002	7	0.002	0.002	0.002	0.000
441700002	11	0.002	0.002	0.002	0.000
443440001	3	0.002	0.002	0.002	0.000
443440002	3	0.002	0.002	0.002	0.000
442920002	8	0.002	0.002	0.002	0.000
440580002	6	0.002	0.002	0.002	0.000

PARAMETER: CADMIUM

METHOD: ATOMIC ABSORPTION
UNITS: MICROGRAMS/CUBIC METER

YEAR: 1972

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
442520001	1	0.033	0.033	0.033	

PARAMETER: CADMIUM

METHOD: ATOMIC ABSORPTION
UNITS: MICROGRAMS/CUBIC METER

YEAR: 1973

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
442740001	11	0.011	0.002	0.033	0.012
442220001	6	0.002	0.002	0.002	0.000
441700001	12	0.018	0.002	0.033	0.011
442280001	4	0.016	0.016	0.016	0.000
442480001	1	0.016	0.016	0.016	
442480002	10	0.012	0.002	0.033	0.013
441700002	14	0.009	0.002	0.033	0.012
443440001	8	0.009	0.002	0.016	0.007
443440002	5	0.008	0.002	0.016	0.008
442920002	11	0.013	0.002	0.051	0.016
440580002	7	0.004	0.002	0.016	0.005
440060001	1	0.033	0.033	0.033	
440500002	1	0.033	0.033	0.033	
440500001	1	0.033	0.033	0.033	

PARAMETER: CADMIUM

METHOD: ATOMIC ABSORPTION
UNITS: MICROGRAMS/CUBIC METER

YEAR: 1974

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
442740001	7	0.002	0.002	0.002	0.000
442220001	3	0.002	0.002	0.002	0.000
441700001	8	0.002	0.002	0.002	0.000
442480002	7	0.002	0.002	0.002	0.000
441700002	11	0.002	0.002	0.002	0.000
443440001	3	0.002	0.002	0.002	0.000
443440002	3	0.002	0.002	0.002	0.000
442920002	8	0.002	0.002	0.002	0.000
440580002	6	0.002	0.002	0.002	0.000

PARAMETER: CHROMIUM

METHOD: ATOMIC ABSORPTION
UNITS: MICROGRAMS/CUBIC METER

YEAR: 1972

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
442220001	1	0.013	0.013	0.013	
442520001	1	0.013	0.013	0.013	

PARAMETER: CHROMIUM

METHOD: ATOMIC ABSORPTION
UNITS: MICROGRAMS/CUBIC METER

YEAR: 1973

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
442740001	10	0.010	0.006	0.035	0.009
442220001	11	0.007	0.006	0.013	0.003
441700001	12	0.029	0.006	0.264	0.074
442280001	4	0.006	0.006	0.006	0.000
442480001	1	0.006	0.006	0.006	
442480002	10	0.019	0.006	0.097	0.029
441700002	14	0.011	0.006	0.065	0.016
443440001	8	0.006	0.006	0.006	0.000
443440002	5	0.006	0.006	0.006	0.000
442920002	11	0.014	0.006	0.065	0.017
440580002	7	0.011	0.006	0.039	0.012
440060001	1	0.013	0.013	0.013	
440500002	1	0.013	0.013	0.013	
440500001	1	0.013	0.013	0.013	

PARAMETER: CHROMIUM

METHOD: ATOMIC ABSORPTION
UNITS: MICROGRAMS/CUBIC METER

YEAR: 1974

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
442740001	7	0.006	0.006	0.006	0.000
442220001	3	0.006	0.006	0.006	0.000
441700001	8	0.006	0.006	0.006	0.000
442480002	7	0.006	0.006	0.006	0.000
441700002	11	0.006	0.006	0.006	0.000
443440001	3	0.006	0.006	0.006	0.000
443440002	3	0.006	0.006	0.006	0.000
442920002	8	0.006	0.006	0.006	0.000
440580002	6	0.006	0.006	0.006	0.000

PARAMETER: LEAD

METHOD: ATOMIC ABSORPTION
UNITS: MICROGRAMS/CUBIC METER

YEAR: 1972

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
442220001	1	0.065	0.065	0.065	
442520001	1	0.065	0.065	0.065	

PARAMETER: LEAD

METHOD: ATOMIC ABSORPTION
UNITS: MICROGRAMS/CUBIC METER

YEAR: 1973

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
442740001	11	0.554	0.185	1.240	0.304
442220001	11	0.141	0.032	0.644	0.194
441700001	12	0.859	0.032	2.420	0.895
442280001	4	0.318	0.135	0.565	0.179
442480001	1	0.815	0.815	0.815	
442480002	10	0.493	0.032	2.260	0.677
441700002	14	1.089	0.065	2.440	0.684
443440001	8	1.028	0.276	3.880	1.181
443440002	5	0.089	0.032	0.246	0.093
442920002	11	1.179	0.098	3.040	1.038
440580002	7	1.580	0.231	2.980	0.992
440060001	1	0.377	0.377	0.377	
440500002	1	0.065	0.065	0.065	
440500001	1	0.185	0.185	0.185	

PARAMETER: LEAD

METHOD: ATOMIC ABSORPTION
UNITS: MICROGRAMS/CUBIC METER

YEAR: 1974

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
442740001	7	0.5814	0.3300	1.0000	0.2124
442220001	3	0.2393	0.1370	0.3000	0.0891
441700001	8	0.2732	0.0330	0.4570	0.1551
442480002	7	0.4097	0.0790	0.9520	0.3830
441700002	11	0.7769	0.1570	2.0500	0.6744
443440001	3	0.6693	0.2040	1.3800	0.6252
443440002	3	0.0580	0.0300	0.1110	0.0459
442920002	8	0.3711	0.1500	0.5820	0.1638
440580002	6	0.7473	0.1750	1.0500	0.3786

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

DIVISION OF AIR RESOURCES

SAROAD DAILY DATA

PARAMETER: LEAD

METHOD: ATOMIC ABSORPTION
UNITS: MICROGRAMS/CUBIC METER

YEAR: 1973

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
330040004	61	0.59	0.00	2.26	0.49
333320003	61	0.24	0.00	1.35	0.24
330660001	61	0.68	0.00	1.93	0.36
330660005	61	0.69	0.00	2.18	0.51
330660007	61	0.59	0.00	1.53	0.33
335760001	61	0.79	0.00	2.09	0.45
332900005	61	0.95	0.00	3.69	0.94
334740001	61	0.45	0.00	2.76	0.38
336880001	60	0.45	0.00	1.28	0.33
336620010	61	0.66	0.00	4.86	0.71
334100002	61	0.87	0.00	2.61	0.68
334680050	61	0.59	0.00	1.61	0.41

CALIFORNIA AIR RESOURCES BOARD

SAROAD DAILY DATA

PARAMETER: CADMIUM

METHOD: ATOMIC ABSORPTION
UNITS: MICROGRAMS/CUBIC METER

YEAR: 1972

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
052800002	31	0.0003	0.0001	0.0060	0.0011
050520003	31	0.0022	0.0001	0.0270	0.0056
054720001	30	0.0003	0.0001	0.0070	0.0013
058520001	31	0.0003	0.0001	0.0070	0.0012
054580001	12	0.0001	0.0001	0.0001	0.0000
051111110	8	0.0001	0.0001	0.0001	0.0000
051111121	2	0.0001	0.0001	0.0001	0.0000
056180002	30	0.0003	0.0001	0.0070	0.0013
056580003	28	0.0028	0.0001	0.0230	0.0059
051260001	30	0.0001	0.0001	0.0001	0.0000
058900001	29	0.0006	0.0001	0.0070	0.0018
051111124	4	0.0001	0.0001	0.0001	0.0000
057040001	28	0.0026	0.0001	0.0120	0.0045
051111125	13	0.0001	0.0001	0.0001	0.0000
051111126	5	0.0001	0.0001	0.0001	0.0000
051111127	2	0.0001	0.0001	0.0001	0.0000
051111128	28	0.0001	0.0001	0.0001	0.0000
051111129	5	0.0001	0.0001	0.0001	0.0000
051111130	2	0.0001	0.0001	0.0001	0.0000
051111131	4	0.0001	0.0001	0.0001	0.0000
051111132	1	0.0000	0.0000	0.0000	
052280001	5	0.0000	0.0000	0.0000	0.0000
051111134	5	0.0000	0.0000	0.0000	0.0000
051111135	6	0.0000	0.0000	0.0000	0.0000
052480001	8	0.0001	0.0001	0.0001	0.0000
056400002	23	0.0031	0.0001	0.0150	0.0044
057200004	30	0.0007	0.0001	0.0100	0.0024
058040002	30	0.0001	0.0001	0.0001	0.0000
058480002	24	0.0006	0.0001	0.0080	0.0019
051111111	14	0.0001	0.0001	0.0001	0.0000
051111112	14	0.0001	0.0001	0.0001	0.0000
057200001	30	0.0001	0.0001	0.0001	0.0000
051111123	2	0.0001	0.0001	0.0001	0.0000

PARAMETER: CADMIUM

METHOD: ATOMIC ABSORPTION
UNITS: MICROGRAMS/CUBIC METER

YEAR: 1973

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
052800002	73	0.0004	0.0001	0.0070	0.0013
050520003	64	0.0062	0.0001	0.0400	0.0091
054720001	51	0.0004	0.0001	0.0080	0.0015
058520001	49	0.0001	0.0001	0.0001	0.0000
054580001	18	0.0001	0.0001	0.0001	0.0000
051111110	5	0.0001	0.0001	0.0001	0.0000
051000001	1	0.0001	0.0001	0.0001	
056180002	44	0.0001	0.0001	0.0001	0.0000
056580003	64	0.0032	0.0001	0.1470	0.0184
051260001	52	0.0007	0.0001	0.0300	0.0041
058900001	51	0.0001	0.0001	0.0001	0.0000
051111124	5	0.0001	0.0001	0.0001	0.0000
057040001	52	0.0022	0.0001	0.0530	0.0076
051111127	10	0.0008	0.0001	0.0070	0.0022
051111128	10	0.0001	0.0001	0.0001	0.0000
051111129	7	0.0001	0.0001	0.0001	0.0000
051111134	1	0.0000	0.0000	0.0000	
051111135	1	0.0000	0.0000	0.0000	
052480001	50	0.0001	0.0001	0.0001	0.0000
056400002	9	0.0001	0.0001	0.0001	0.0000
057200004	58	0.0023	0.0001	0.0150	0.0040
051111136	12	0.0010	0.0001	0.0110	0.0031
058040002	50	0.0023	0.0001	0.0270	0.0058
051111137	20	0.0006	0.0001	0.0100	0.0022
051111138	10	0.0001	0.0001	0.0001	0.0000
051111139	11	0.0001	0.0001	0.0001	0.0000
051111140	22	0.0052	0.0001	0.0220	0.0073
051111141	5	0.0001	0.0001	0.0001	0.0000
051111143	27	0.0003	0.0001	0.0060	0.0011
051111144	8	0.0012	0.0001	0.0090	0.0031
056620001	30	0.0008	0.0001	0.0070	0.0018
056680001	26	0.0001	0.0001	0.0001	0.0000
051030001	27	0.0016	0.0001	0.0110	0.0032
052220001	29	0.0001	0.0001	0.0001	0.0000
056800004	29	0.0001	0.0001	0.0001	0.0000
054540001	24	0.0001	0.0001	0.0001	0.0000
051111147	16	0.0001	0.0001	0.0001	0.0000
051111148	16	0.0001	0.0001	0.0001	0.0000
051111149	13	0.0001	0.0001	0.0001	0.0000
058240001	1	0.0001	0.0001	0.0001	
051111150	22	0.0004	0.0001	0.0070	0.0015
051111151	25	0.0001	0.0001	0.0001	0.0000
058740001	19	0.0001	0.0001	0.0001	0.0000
057340001	17	0.0017	0.0001	0.0120	0.0036
051111153	8	0.0001	0.0001	0.0001	0.0000
051111112	5	0.0001	0.0001	0.0001	0.0000
057200001	51	0.0004	0.0001	0.0090	0.0016
051111160	43	0.0018	0.0001	0.0160	0.0038
051111161	1	0.0001	0.0001	0.0001	

PARAMETER: CADMIUM

METHOD: ATOMIC ABSORPTION
UNITS: MICROGRAMS/CUBIC METER

YEAR: 1974

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
052800002	59	0.0003	0.0001	0.0090	0.0012
050520003	59	0.0087	0.0001	0.2460	0.0325
054580001	11	0.0001	0.0001	0.0001	0.0000
056580003	70	0.0013	0.0001	0.0120	0.0030
051111125	15	0.0001	0.0001	0.0001	0.0000
051111127	4	0.0001	0.0001	0.0001	0.0000
051111129	1	0.0001	0.0001	0.0001	
057200004	47	0.0014	0.0001	0.0090	0.0028
051111136	15	0.0005	0.0001	0.0060	0.0015
051111137	2	0.0001	0.0001	0.0001	0.0000
051111138	4	0.0001	0.0001	0.0001	0.0000
051111139	3	0.0001	0.0001	0.0001	0.0000
051111144	30	0.0001	0.0001	0.0001	0.0000
056620001	30	0.0004	0.0001	0.0090	0.0016
056680001	23	0.0001	0.0001	0.0001	0.0000
051030001	30	0.0006	0.0001	0.0090	0.0019
052220001	26	0.0001	0.0001	0.0001	0.0000
056800004	27	0.0001	0.0001	0.0001	0.0000
054540001	41	0.0001	0.0001	0.0001	0.0000
051111150	27	0.0001	0.0001	0.0001	0.0000
051111151	29	0.0004	0.0001	0.0090	0.0017
058740001	14	0.0001	0.0001	0.0001	0.0000
057340001	72	0.0031	0.0001	0.1030	0.0125
051111153	29	0.0001	0.0001	0.0001	0.0000
051111155	24	0.0001	0.0001	0.0001	0.0000
051111160	42	0.0011	0.0001	0.0170	0.0038

PARAMETER: LEAD

METHOD: ATOMIC ABSORPTION
UNITS: MICROGRAMS/CUBIC METER

YEAR: 1971

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
056300001	48	0.47	0.16	1.36	0.30
055880001	48	0.43	0.10	2.34	0.42
057160001	49	1.30	0.46	3.84	0.87
056240001	50	0.77	0.16	3.13	0.59
050920001	51	0.84	0.21	3.23	0.65
052800002	32	1.66	0.32	4.49	1.27
050520003	36	1.57	0.29	3.86	0.94
050580001	3	0.47	0.10	0.80	0.35
058510001	3	0.80	0.80	0.80	0.00
051111121	8	0.33	0.20	0.47	0.11
051000001	12	0.65	0.27	1.27	0.31
051111122	1	0.60	0.60	0.60	
056180002	36	0.45	0.10	1.26	0.22
056580003	35	0.99	0.20	2.98	0.79
057040001	36	0.72	0.20	1.80	0.43
052480001	2	0.44	0.33	0.56	0.16
058040002	3	0.43	0.36	0.53	0.09
050230001	6	2.33	1.40	3.90	0.87
053620001	5	1.94	1.50	2.50	0.36
056680001	4	1.85	0.80	2.50	0.76
054180001	12	1.75	1.08	3.29	0.66
050500002	6	1.18	0.55	1.74	0.45
053900001	12	2.75	1.13	5.21	1.40
051111111	2	0.51	0.31	0.72	0.29
051111112	1	0.47	0.47	0.47	
054180002	12	1.09	0.53	1.99	0.50
054200001	12	1.41	0.45	3.11	0.77
055380002	3	2.93	1.00	3.90	1.67
056200001	4	2.05	0.90	2.80	0.93
051111113	4	1.90	1.80	2.00	0.08
051111114	4	1.15	0.40	1.60	0.57
055380001	3	2.53	2.20	2.70	0.29
051111115	3	0.83	0.70	0.90	0.12
051111116	4	1.80	0.70	2.60	0.82
055760002	6	1.11	0.96	1.58	0.24
051111118	1	0.70	0.70	0.70	
056800001	24	2.19	0.61	6.81	1.72
051111119	13	2.69	1.43	5.85	1.14
056580003	49	1.45	0.29	4.62	1.06
054020002	50	0.59	0.23	1.87	0.37
052780001	47	0.73	0.23	3.96	0.58

PARAMETER: LEAD

METHOD: ATOMIC ABSORPTION
UNITS: MICROGRAMS/CUBIC METER

YEAR: 1972

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
056300001	8	0.7987	0.3900	1.5500	0.3736
056300002	27	0.4330	0.1000	0.9200	0.1747
055880001	37	0.3492	0.1000	1.0500	0.2523
057160001	33	1.3773	0.1600	3.5400	0.9095
056240001	36	0.7964	0.2100	2.5200	0.6037
050920001	31	0.9755	0.1600	3.9300	1.0367
052800002	61	1.4282	0.1400	4.6300	0.9381
050520003	62	1.4281	0.2400	3.9600	0.8251
054720001	41	0.7761	0.2600	1.8200	0.3808
058520001	46	0.7902	0.1500	1.6700	0.3397
054580001	17	0.5682	0.1100	1.2300	0.2812
051111110	10	0.7690	0.3300	1.7300	0.4431
050580001	4	0.5750	0.4000	0.8000	0.1708
058510001	4	0.7000	0.5000	0.8000	0.1414
051111121	6	0.2300	0.0001	0.3800	0.1463
051111122	4	0.4000	0.3000	0.6000	0.1414
056180002	60	0.5090	0.0800	2.0100	0.2873
056580003	59	0.7852	0.1900	2.6100	0.5049
051260001	55	0.6335	0.1900	1.8400	0.3472
058900001	52	0.4629	0.1000	1.3000	0.2656
051111124	4	0.4500	0.3100	0.5900	0.1146
057040001	60	0.6868	0.0400	2.3100	0.4856
051111125	21	0.2210	0.0600	0.4000	0.0920
051111126	5	0.2080	0.1800	0.2400	0.0239
051111127	2	0.2350	0.0700	0.4000	0.2333
051111128	28	0.3104	0.0900	0.5500	0.1173
051111129	5	0.5660	0.3200	1.3000	0.4139
051111130	2	0.1750	0.1700	0.1800	0.0071
051111131	4	0.0850	0.0001	0.1500	0.0635
051111132	1	0.1300	0.1300	0.1300	
052280001	5	0.4240	0.2200	0.5200	0.1244
051111134	5	0.1460	0.0800	0.2000	0.0467
051111135	6	0.5367	0.1900	0.8300	0.2316
052480001	48	0.4760	0.1900	1.3000	0.2497
056400002	22	1.1459	0.3200	2.1800	0.5588
057200002	49	1.0882	0.2500	2.2900	0.4661
057200004	48	1.0898	0.2500	4.2900	0.7799
058040002	49	0.7784	0.2600	2.2000	0.3950
055000002	23	0.5791	0.2100	1.2800	0.2720
056980004	8	1.0700	0.3900	2.7200	0.7977
058480001	19	0.5421	0.2100	2.0300	0.5035
056680001	4	1.7500	1.2000	2.1000	0.4359
054180001	12	1.3733	0.9000	2.4000	0.4660
050500002	12	1.1017	0.6600	1.5900	0.2917
053900001	12	2.2600	1.0100	4.5600	1.2060
058480002	15	0.3507	0.1500	0.7500	0.1832
051111111	23	0.5448	0.1800	1.6200	0.3846
051111112	24	0.1879	0.0600	0.6100	0.1594
054180002	12	0.9350	0.5800	1.6200	0.3376

PARAMETER: LEAD

METHOD: ATOMIC ABSORPTION
UNITS: MICROGRAMS/CUBIC METER

YEAR: 1972

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
054200001	12	1.7392	1.2100	[illegible]	0.7173
055380002	4	2.1000	1.6000	[illegible]	0.4761
056200001	4	1.7500	1.4000	[illegible].3000	0.3873
051111113	4	1.7250	0.9000	2.6000	0.7365
051111114	4	1.5250	1.2000	1.8000	0.2754
055380001	4	1.6500	1.2000	2.8000	0.7681
051111115	4	0.4750	0.1000	0.8000	0.3775
051111116	4	1.3000	0.8000	1.7000	0.4243
051111117	10	1.1720	0.6900	1.9500	0.4047
051111118	4	0.3000	0.2000	0.4000	0.0817
056800001	34	1.7897	0.4000	5.3000	1.3754
056980003	21	1.5376	0.3300	4.3600	1.0830
054020002	13	0.7215	0.2300	1.4100	0.3745
054020007	24	0.4646	0.2100	0.9200	0.2199
052780001	37	0.6713	0.1600	2.1000	0.4444
055800001	18	0.4094	0.1700	1.1200	0.2151
056860003	21	0.9115	0.1600	1.7700	0.4562
057400001	10	0.6500	0.2300	1.2100	0.3266

PARAMETER: LEAD

METHOD: ATOMIC ABSORPTION
UNITS: MICROGRAMS/CUBIC METER

YEAR: 1973

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
056240001	29	0.85	0.08	2.89	0.67
052800002	68	1.46	0.01	5.28	0.92
050520003	64	1.49	0.43	5.15	0.89
054720001	51	0.74	0.21	2.69	0.42
058520001	49	0.75	0.21	1.83	0.33
054580001	18	0.71	0.21	1.40	0.30
051000001	1	1.50	1.50	1.50	
056180002	48	0.39	0.18	0.72	0.12
056580003	64	0.68	0.16	2.63	0.46
051260001	52	0.57	0.12	1.70	0.33
051111124	5	0.35	0.17	0.52	0.14
057040001	52	0.60	0.03	1.75	0.37
051111127	56	0.46	0.14	1.57	0.29
051111128	10	0.26	0.11	0.45	0.13
051111129	7	0.59	0.21	0.85	0.23
051111135	1	0.56	0.56	0.56	
052480001	51	0.46	0.12	1.14	0.23
051111102	5	0.16	0.06	0.34	0.11
056400002	9	0.87	0.23	1.63	0.59
057200002	51	0.96	0.14	2.07	0.41
057200004	58	1.01	0.13	3.63	0.79
051111136	17	0.67	0.35	1.71	0.32
058040002	49	0.74	0.18	2.74	0.44
051111137	20	0.05	0.01	0.22	0.06
051111138	11	0.48	0.10	0.91	0.26
051111139	10	0.31	0.11	0.44	0.11
051111140	22	0.10	0.01	0.30	0.08
051111141	5	0.23	0.18	0.29	0.05
051111142	1	0.01	0.01	0.01	
051111143	27	0.20	0.01	0.51	0.12
056400001	43	2.31	0.74	4.97	1.06
055000002	29	0.70	0.08	2.00	0.51
056980004	28	1.29	0.33	3.61	0.94
058480001	30	0.74	0.16	4.00	0.79
051111144	8	0.34	0.16	0.55	0.15
051111145	30	0.67	0.14	5.58	0.98
056620001	30	0.40	0.14	0.99	0.24
050230001	45	2.12	0.70	5.70	1.05
053620001	45	1.91	0.60	4.20	0.81
056680001	26	1.48	0.34	3.38	0.69
051030001	28	0.65	0.13	1.46	0.32
054180001	37	1.43	0.33	7.00	1.15
050500002	37	0.82	0.23	1.84	0.37
053900001	37	2.01	0.52	5.37	1.20
055760001	37	1.13	0.31	2.10	0.45
052220001	29	1.89	0.75	5.83	1.17
056800004	29	1.65	0.21	6.92	1.72
054540001	25	0.38	0.09	0.80	0.18
051111147	16	0.32	0.08	0.54	0.11

PARAMETER: LEAD

METHOD: ATOMIC ABSORPTION
UNITS: MICROGRAMS/CUBIC METER

YEAR: 1973

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
051111148	16	0.32	0.08	0.54	0.11
051111149	13	0.53	0.19	0.96	0.23
058240001	1	0.57	0.57	0.57	
051111150	22	0.60	0.20	1.82	0.40
051111151	25	1.00	0.41	1.87	0.42
058740001	19	0.32	0.16	0.55	0.10
057340001	17	0.50	0.22	0.69	0.13
051111153	8	0.26	0.06	0.47	0.13

PARAMETER: LEAD

METHOD: ATOMIC ABSORPTION
UNITS: MICROGRAMS/CUBIC METER

YEAR: 1974

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
056240001	40	0.57	0.06	4.67	0.78
052800002	90	0.84	0.01	3.47	0.57
050520003	87	1.09	0.23	2.40	0.53
054580001	16	0.48	0.15	0.94	0.21
056580003	84	0.59	0.13	1.88	0.36
051111124	16	0.23	0.05	0.40	0.13
051111125	10	0.13	0.07	0.24	0.06
051111127	8	0.18	0.07	0.33	0.07
051111129	1	0.05	0.05	0.05	
057200004	63	0.51	0.28	3.09	0.56
051111136	15	0.49	0.17	1.04	0.21
051111137	2	0.05	0.01	0.09	0.06
051111138	4	0.56	0.17	1.36	0.54
051111139	5	0.46	0.16	0.87	0.27
056400001	88	1.69	0.35	3.05	0.61
055000002	38	0.51	0.05	2.05	0.53
056980004	38	0.66	0.11	2.30	0.57
058480001	41	0.51	0.06	3.12	0.58
051111144	44	0.18	0.01	0.47	0.10
051111145	39	0.31	0.03	1.48	0.29
056620001	44	0.36	0.01	0.91	0.20
050230001	68	1.51	0.24	3.50	0.77
053620001	66	1.60	0.30	4.30	0.92
056680001	35	1.20	0.16	2.57	0.49
051030001	46	0.57	0.15	1.38	0.26
054180001	41	0.85	0.23	2.26	0.44
050500002	43	0.57	0.06	1.04	0.23
053900001	43	1.28	0.42	3.30	0.68
055760001	43	0.64	0.18	1.34	0.29
052220001	41	1.00	0.39	3.09	0.51
056800004	43	0.87	0.14	3.73	0.78
054540001	41	0.30	0.05	0.70	0.14
051111150	42	0.41	0.16	1.45	0.24
051111151	44	0.61	0.26	1.55	0.27
058740001	38	0.26	0.11	0.69	0.12
057340001	88	0.43	0.19	0.83	0.13
051111153	43	0.33	0.08	0.65	0.12
051111154	33	0.31	0.05	0.53	0.14
051111155	39	0.35	0.01	1.04	0.18
051111156	13	1.72	0.75	3.18	0.66
053420001	16	0.51	0.18	1.00	0.26
051111157	21	0.62	0.11	1.80	0.38
051111158	22	0.98	0.18	2.22	0.61
051111159	22	1.57	0.93	2.76	0.50
054120001	22	1.03	0.33	2.10	0.59

TEXAS STATE DEPARTMENT OF HEALTH

AIR POLLUTION CONTROL SERVICES

SAROAD DAILY DATA

PARAMETER: ARSENIC

METHOD: X-RAY FLUCRESCENCE
UNITS: MICROGRAMS/CUBIC METER

YEAR: 1973

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
450010001	21	0.0	0.0	0.0	0.0
450660001	42	0.0	0.0	0.1	0.0
455560002	20	0.0	0.0	0.0	0.0
450070002	7	0.0	0.0	0.0	0.0
453340001	17	0.0	0.0	0.0	0.0
454010001	35	0.0	0.0	0.0	0.0
450220002	8	0.0	0.0	0.0	0.0
450220004	245	0.0	0.0	0.9	0.1
450220005	31	0.0	0.0	0.0	0.0
450220006	40	0.0	0.0	0.1	0.0
450220007	36	0.0	0.0	0.0	0.0
450220008	42	0.0	0.0	0.0	0.0
450220010	7	0.0	0.0	0.0	0.0
450670001	30	0.0	0.0	0.0	0.0
454640001	38	0.0	0.0	0.0	0.0
455210001	7	0.0	0.0	0.0	0.0
455210002	124	0.0	0.0	0.0	0.0
455370001	29	0.0	0.0	0.0	0.0
455370007	33	0.0	0.0	0.0	0.0
452320001	44	0.0	0.0	0.0	0.0
453140001	4	0.0	0.0	0.0	0.0
453390001	37	0.0	0.0	0.0	0.0
454600001	43	0.0	0.0	0.0	0.0
450720001	21	0.0	0.0	0.0	0.0
451150001	16	0.0	0.0	0.0	0.0
451150003	46	0.0	0.0	0.0	0.0
451150004	34	0.0	0.0	0.0	0.0
451150019	18	0.0	0.0	0.0	0.0
450440001	43	0.0	0.0	0.0	0.0
453620001	19	0.0	0.0	0.0	0.0
453910001	41	0.0	0.0	0.0	0.0
454560001	23	0.0	0.0	0.0	0.0
450060001	46	0.0	0.0	0.1	0.0
450320001	54	0.0	0.0	0.1	0.0
450320002	56	0.0	0.0	0.1	0.0
450320003	54	0.0	0.0	0.1	0.0
450860001	48	0.0	0.0	0.1	0.0
450860002	55	0.0	0.0	0.1	0.0
450860004	56	0.0	0.0	0.1	0.0
450950002	50	0.0	0.0	0.0	0.0
451935001	10	0.0	0.0	0.1	0.0
451980001	51	0.0	0.0	0.2	0.0
451980047	8	0.0	0.0	0.0	0.0
451990025	10	0.0	0.0	0.0	0.0
452330003	49	0.0	0.0	0.1	0.0
452330004	53	0.0	0.0	0.1	0.0
452330005	52	0.0	0.0	0.2	0.0
452330006	52	0.0	0.0	0.2	0.0
452560034	30	0.0	0.0	0.1	0.0

PARAMETER: ARSENIC

METHOD: X-RAY FLUORESCENCE
UNITS: MICROGRAMS/CUBIC METER

YEAR: 1973

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
453070024	8	0.2	0.0	0.5	0.2
453130002	49	0.0	0.0	0.1	0.0
453170001	24	0.0	0.0	0.1	0.0
453170026	9	0.0	0.0	0.1	0.0
454060006	47	0.0	0.0	0.1	0.0
454890001	54	0.0	0.0	0.2	0.0
455170003	11	0.0	0.0	0.1	0.0
455170004	10	0.0	0.0	0.0	0.0
455170011	42	0.0	0.0	0.1	0.0
455170043	11	0.0	0.0	0.2	0.1
455170045	5	0.0	0.0	0.0	0.0
455195001	53	0.0	0.0	0.1	0.0
450170001	31	0.0	0.0	0.0	0.0
450170002	43	0.0	0.0	0.0	0.0
450170003	19	0.0	0.0	0.1	0.0
450170004	29	0.0	0.0	0.0	0.0
451310045	12	0.0	0.0	0.0	0.0
451410001	24	0.0	0.0	0.0	0.0
451880001	44	0.0	0.0	0.0	0.0
452130001	40	0.0	0.0	0.0	0.0
452130002	38	0.0	0.0	0.0	0.0
455420002	12	0.0	0.0	0.0	0.0
451580003	34	0.0	0.0	0.0	0.0
450330001	11	0.0	0.0	0.0	0.0
453830003	12	0.0	0.0	0.0	0.0
453950002	30	0.0	0.0	0.0	0.0
454190006	80	0.0	0.0	0.0	0.0
451700002	37	0.1	0.0	0.5	0.1
451700027	10	0.1	0.0	0.3	0.1
453770001	3	0.0	0.0	0.0	0.0
455160001	41	0.0	0.0	0.0	0.0
455240002	31	0.0	0.0	0.0	0.0

PARAMETER: ARSENIC

METHOD: X-RAY FLUORESCENCE
UNITS: MICROGRAMS/CUBIC METER

YEAR: 1974

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
450010001	40	0.0	0.0	0.0	0.0
450660001	38	0.0	0.0	0.0	0.0
455560002	17	0.0	0.0	0.0	0.0
450070002	10	0.0	0.0	0.0	0.0
453340001	14	0.0	0.0	0.0	0.0
454010001	6	0.0	0.0	0.0	0.0
450220004	154	0.0	0.0	0.1	0.0
450220005	53	0.0	0.0	0.0	0.0
450220006	48	0.0	0.0	0.0	0.0
450220007	52	0.0	0.0	0.1	0.0
450220008	51	0.0	0.0	0.0	0.0
450220010	18	0.0	0.0	0.1	0.0
450670001	53	0.0	0.0	0.0	0.0
454640001	54	0.0	0.0	0.0	0.0
455210001	18	0.0	0.0	0.0	0.0
455210002	123	0.0	0.0	0.0	0.0
455370001	1	0.0	0.0	0.0	
455370007	20	0.0	0.0	0.0	0.0
452320001	50	0.0	0.0	0.0	0.0
453140001	5	0.0	0.0	0.0	0.0
453390001	42	0.0	0.0	0.0	0.0
454600001	43	0.0	0.0	0.0	0.0
450720001	31	0.0	0.0	0.0	0.0
451150001	19	0.0	0.0	0.1	0.0
451150003	48	0.0	0.0	0.1	0.0
451150004	49	0.0	0.0	0.1	0.0
451150019	46	0.0	0.0	0.0	0.0
450440001	40	0.0	0.0	0.0	0.0
453620001	8	0.0	0.0	0.0	0.0
453910001	24	0.0	0.0	0.1	0.0
454560001	28	0.0	0.0	0.0	0.0
450060001	44	0.0	0.0	0.0	0.0
450320001	34	0.0	0.0	0.0	0.0
450320002	35	0.0	0.0	0.0	0.0
450320003	16	0.0	0.0	0.0	0.0
450860001	20	0.0	0.0	0.0	0.0
450860002	7	0.0	0.0	0.0	0.0
450860004	2	0.0	0.0	0.0	0.0
450950002	51	0.0	0.0	0.0	0.0
451935001	2	0.0	0.0	0.0	0.0
451980001	26	0.0	0.0	0.0	0.0
451980047	2	0.0	0.0	0.0	0.0
451990025	2	0.0	0.0	0.0	0.0
452330003	41	0.0	0.0	0.0	0.0
452330004	41	0.0	0.0	0.0	0.0
452330005	45	0.0	0.0	0.0	0.0
452330006	44	0.0	0.0	0.0	0.0
452560034	29	0.0	0.0	0.0	0.0
453130002	42	0.0	0.0	[illegible]	0.0

PARAMETER: ARSENIC

METHOD: X-RAY FLUORESCENCE
UNITS: MICROGRAMS/CUBIC METER

YEAR: 1974

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
453170001	19	0.0	0.0	0.0	0.0
453170026	2	0.0	0.0	0.0	0.0
454060006	41	0.0	0.0	0.0	0.0
454890001	31	0.0	0.0	0.0	0.0
455170003	2	0.0	0.0	0.0	0.0
455170004	2	0.0	0.0	0.0	0.0
455170011	56	0.0	0.0	1.2	0.2
455170043	2	0.0	0.0	0.0	0.0
455195001	43	0.0	0.0	0.0	0.0
450170001	10	0.0	0.0	0.0	0.0
450170002	16	0.0	0.0	0.0	0.0
450170004	8	0.0	0.0	0.0	0.0
451310045	33	0.0	0.0	0.1	0.0
451410001	22	0.0	0.0	0.0	0.0
451880001	49	0.0	0.0	0.1	0.0
452130001	57	0.0	0.0	0.0	0.0
452130002	50	0.0	0.0	0.0	0.0
455420002	39	0.0	0.0	0.1	0.0
451580003	53	0.0	0.0	0.1	0.0
450330001	9	0.0	0.0	0.0	0.0
453830003	34	0.0	0.0	0.0	0.0
453950002	18	0.0	0.0	0.0	0.0
454190006	27	0.0	0.0	0.0	0.0
451700002	32	0.1	0.0	0.4	0.1
451700027	51	0.1	0.0	0.5	0.1
453770001	37	0.0	0.0	0.0	0.0
455160001	52	0.0	0.0	0.1	0.0
455240002	52	0.0	0.0	0.1	0.0
450220012	19	0.0	0.0	0.0	0.0
450650002	34	0.0	0.0	0.0	0.0
450650003	51	0.0	0.0	0.0	0.0
450750001	3	0.0	0.0	0.0	0.0
452460002	4	0.0	0.0	0.0	0.0
452460003	3	0.0	0.0	0.0	0.0
452460004	3	0.0	0.0	0.0	0.0
455460001	3	0.0	0.0	0.0	0.0
456000004	19	0.0	0.0	0.0	0.0
456000005	12	0.0	0.0	0.0	0.0
450440002	8	0.0	0.0	0.0	0.0
450950003	3	0.0	0.0	0.0	0.0
452330024	17	0.0	0.0	0.0	0.0
455170002	12	0.0	0.0	0.0	0.0
451744001	8	0.0	0.0	0.0	0.0
452670001	8	0.0	0.0	0.0	0.0
453210001	12	0.0	0.0	0.0	0.0
454790003	28	0.0	0.0	0.0	0.0
455070001	2	0.0	0.0	0.0	0.0
451380002	9	0.0	0.0	0.0	0.0
454570036	27	0.0	0.0	0.0	0.0

PARAMETER: ARSENIC

METHOD: X-RAY FLUORESCENCE
UNITS: MICROGRAMS/CUBIC METER

YEAR: 1974

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
456000001	25	0.0	0.0	0.0	0.0
456000002	21	0.0	0.0	0.0	0.0
456000003	20	0.0	0.0	0.0	0.0
456000006	2	0.0	0.0	0.0	0.0
455480001	24	0.0	0.0	0.0	0.0
450050001	9	0.0	0.0	0.0	0.0
451270001	10	0.0	0.0	0.0	0.0
451700028	17	0.0	0.0	0.3	0.1
451710004	6	0.0	0.0	0.0	0.0
451710005	19	0.1	0.0	1.1	0.3
451710006	26	0.0	0.0	0.1	0.0
452740001	12	0.0	0.0	0.0	0.0
452740002	6	0.0	0.0	0.0	0.0

PARAMETER: CADMIUM

METHOD: X-RAY FLUORESCENCE
UNITS: MICROGRAMS/CUBIC METER

YEAR: 1973

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
450010001	21	0.0	0.0	0.0	0.0
450660001	42	0.0	0.0	0.0	0.0
455560002	20	0.0	0.0	0.0	0.0
450070002	7	0.0	0.0	0.0	0.0
453340001	17	0.0	0.0	0.0	0.0
454010001	35	0.0	0.0	0.0	0.0
450220002	8	0.0	0.0	0.0	0.0
450220004	83	0.0	0.0	0.0	0.0
450220005	31	0.0	0.0	0.0	0.0
450220006	40	0.0	0.0	0.0	0.0
450220007	36	0.0	0.0	0.0	0.0
450220008	42	0.0	0.0	0.0	0.0
450220010	7	0.0	0.0	0.0	0.0
450670001	30	0.0	0.0	0.1	0.0
454640001	38	0.0	0.0	0.0	0.0
455210001	7	0.0	0.0	0.0	0.0
455210002	8	0.0	0.0	0.0	0.0
455370001	29	0.0	0.0	0.0	0.0
455370007	33	0.0	0.0	0.0	0.0
452320001	44	0.0	0.0	0.1	0.0
453140001	4	0.0	0.0	0.0	0.0
453390001	37	0.0	0.0	0.0	0.0
454600001	43	0.0	0.0	0.0	0.0
450720001	21	0.0	0.0	0.0	0.0
451150001	16	0.0	0.0	0.0	0.0
451150003	46	0.0	0.0	0.1	0.0
451150004	34	0.0	0.0	0.1	0.0
451150019	18	0.0	0.0	0.1	0.0
450440001	43	0.0	0.0	0.0	0.0
453620001	19	0.0	0.0	0.0	0.0
453910001	41	0.0	0.0	0.0	0.0
454560001	23	0.0	0.0	0.0	0.0
450060001	33	0.0	0.0	0.0	0.0
450320001	35	0.0	0.0	0.0	0.0
450320002	42	0.0	0.0	0.0	0.0
450320003	39	0.0	0.0	1.1	0.2
450860001	37	0.0	0.0	0.2	0.0
450860002	42	0.0	0.0	0.0	0.0
450860004	43	0.0	0.0	0.0	0.0
450950002	37	0.0	0.0	0.0	0.0
451980001	43	0.0	0.0	0.0	0.0
452330003	34	0.0	0.0	0.0	0.0
452330004	38	0.0	0.0	0.0	0.0
452330005	37	0.0	0.0	0.1	0.0
452330006	38	0.0	0.0	0.0	0.0
452560034	30	0.0	0.0	0.0	0.0
453130002	35	0.0	0.0	0.1	0.0
453170001	20	0.0	0.0	0.0	0.0
454060006	32	0.0	0.0	0.1	0.0

PARAMETER: CADMIUM

METHOD: X-RAY FLUORESCENCE
UNITS: MICROGRAMS/CUBIC METER

YEAR: 1973

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
454890001	39	0.0	0.0	0.0	0.0
455170011	27	0.0	0.0	0.0	0.0
455195001	38	0.0	0.0	0.0	0.0
450170001	31	0.0	0.0	0.0	0.0
450170002	43	0.0	0.0	0.0	0.0
450170003	19	0.0	0.0	0.0	0.0
450170004	29	0.0	0.0	0.0	0.0
451310045	12	0.0	0.0	0.0	0.0
451410001	24	0.0	0.0	0.0	0.0
451880001	44	0.0	0.0	0.0	0.0
452130001	40	0.0	0.0	0.0	0.0
452130002	38	0.0	0.0	0.0	0.0
455420002	12	0.0	0.0	0.0	0.0
451580003	34	0.0	0.0	0.0	0.0
450330001	11	0.0	0.0	0.0	0.0
453830003	12	0.0	0.0	0.0	0.0
453950002	29	0.0	0.0	0.0	0.0
454190006	79	0.0	0.0	0.1	0.0
451700002	37	0.0	0.0	0.1	0.0
451700027	10	0.0	0.0	0.0	0.0
453770001	3	0.0	0.0	0.0	0.0
455160001	41	0.0	0.0	0.0	0.0
455240002	31	0.0	0.0	0.0	0.0

PARAMETER: CADMIUM

METHOD: X-RAY FLUORESCENCE
UNITS: MICROGRAMS/CUBIC METER

YEAR: 1974

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
450010001	40	0.0	0.0	0.0	0.0
450660001	38	0.0	0.0	0.0	0.0
455560002	17	0.0	0.0	0.0	0.0
450070002	10	0.0	0.0	0.0	0.0
453340001	14	0.0	0.0	0.1	0.0
454010001	6	0.0	0.0	0.0	0.0
450220004	154	0.0	0.0	0.8	0.1
450220005	53	0.0	0.0	0.0	0.0
450220006	48	0.0	0.0	0.0	0.0
450220007	53	0.0	0.0	0.0	0.0
450220008	51	0.0	0.0	0.0	0.0
450220010	18	0.0	0.0	0.0	0.0
450670001	53	0.0	0.0	0.0	0.0
454640001	54	0.0	0.0	0.1	0.0
455210001	16	0.0	0.0	0.0	0.0
455210002	115	0.0	0.0	0.0	0.0
455370001	1	0.0	0.0	0.0	
455370007	20	0.0	0.0	0.0	0.0
452320001	50	0.0	0.0	0.0	0.0
453140001	5	0.0	0.0	0.0	0.0
453390001	42	0.0	0.0	0.0	0.0
454600001	43	0.0	0.0	0.1	0.0
450720001	31	0.0	0.0	0.1	0.0
451150001	19	0.0	0.0	0.0	0.0
451150003	48	0.0	0.0	0.0	0.0
451150004	49	0.0	0.0	0.1	0.0
451150019	46	0.0	0.0	0.0	0.0
450440001	40	0.0	0.0	0.0	0.0
453620001	8	0.0	0.0	0.0	0.0
453910001	24	0.0	0.0	0.0	0.0
454560001	28	0.0	0.0	0.0	0.0
450060001	44	0.0	0.0	0.1	0.0
450320001	34	0.0	0.0	0.0	0.0
450320002	35	0.0	0.0	0.2	0.0
450320003	16	0.0	0.0	0.0	0.0
450860001	20	0.1	0.0	1.6	0.4
450860002	7	0.0	0.0	0.0	0.0
450860004	2	0.0	0.0	0.0	0.0
450950002	51	0.0	0.0	0.0	0.0
451980001	26	0.0	0.0	0.0	0.0
452330003	41	0.0	0.0	0.0	0.0
452330004	41	0.0	0.0	0.1	0.0
452330005	45	0.0	0.0	0.0	0.0
452330006	44	0.0	0.0	0.1	0.0
452560034	29	0.0	0.0	0.0	0.0
453130002	42	0.0	0.0	0.0	0.0
453170001	19	0.0	0.0	0.0	0.0
454060006	41	0.0	0.0	0.0	0.0
454890001	31	0.0	0.0	0.0	0.0

PARAMETER: CADMIUM

METHOD: X-RAY FLUORESCENCE
UNITS: MICROGRAMS/CUBIC METER

YEAR: 1974

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
455170011	56	0.0	0.0	0.3	0.0
455195001	43	0.0	0.0	0.0	0.0
450170001	10	0.0	0.0	0.0	0.0
450170002	16	0.0	0.0	0.0	0.0
450170004	8	0.0	0.0	0.0	0.0
451310045	33	0.0	0.0	0.0	0.0
451410001	22	0.0	0.0	0.0	0.0
451880001	49	0.0	0.0	0.0	0.0
452130001	57	0.0	0.0	0.0	0.0
452130002	50	0.0	0.0	0.0	0.0
455420002	39	0.0	0.0	0.0	0.0
451580003	53	0.0	0.0	0.0	0.0
450330001	9	0.0	0.0	0.0	0.0
453830003	34	0.0	0.0	0.0	0.0
453950002	18	0.0	0.0	0.1	0.0
454190006	27	0.0	0.0	0.0	0.0
451700002	32	0.0	0.0	0.0	0.0
451700027	51	0.0	0.0	0.0	0.0
453770001	37	0.0	0.0	0.0	0.0
455160001	52	0.0	0.0	0.0	0.0
455240002	52	0.0	0.0	0.0	0.0
450220012	19	0.0	0.0	0.0	0.0
450650002	34	0.0	0.0	0.0	0.0
450650003	51	0.0	0.0	0.0	0.0
450750001	3	0.0	0.0	0.0	0.0
452460002	4	0.0	0.0	0.0	0.0
452460003	3	0.0	0.0	0.0	0.0
452460004	3	0.0	0.0	0.0	0.0
455460001	3	0.0	0.0	0.0	0.0
456000004	19	0.0	0.0	0.1	0.0
456000005	12	0.0	0.0	0.0	0.0
450440002	8	0.0	0.0	0.0	0.0
450950003	3	0.0	0.0	0.0	0.0
452330024	17	0.0	0.0	0.0	0.0
455170002	12	0.0	0.0	0.0	0.0
451744001	8	0.0	0.0	0.0	0.0
452670001	8	0.0	0.0	0.0	0.0
453210001	12	0.0	0.0	0.0	0.0
454790003	28	0.0	0.0	0.0	0.0
455070001	2	0.0	0.0	0.0	0.0
451380002	9	0.0	0.0	0.0	0.0
454570036	27	0.0	0.0	0.0	0.0
456000001	25	0.0	0.0	0.0	0.0
456000002	21	0.0	0.0	0.0	0.0
456000003	20	0.0	0.0	0.0	0.0
456000006	2	0.0	0.0	0.0	0.0
455480001	24	0.0	0.0	0.0	0.0
450050001	9	0.0	0.0	0.0	0.0
451270001	10	0.0	0.0	0.0	0.0

PARAMETER: CADMIUM

METHOD: X-RAY FLUORESCENCE
UNITS: MICROGRAMS/CUBIC METER

YEAR: 1974

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
451700028	17	0.0	0.0	0.0	0.0
451710004	6	0.0	0.0	0.0	0.0
451710005	19	0.0	0.0	0.0	0.0
451710006	26	0.0	0.0	0.0	0.0
452740001	12	0.0	0.0	0.0	0.0
452740002	6	0.0	0.0	0.0	0.0

PARAMETER: CHROMIUM

METHOD: X-RAY FLUCRESCENCE
UNITS: MICROGRAMS/CUBIC METER

YEAR: 1973

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
450010001	21	0.0	0.0	0.1	0.0
450660001	42	0.0	0.0	0.1	0.0
455560002	20	0.0	0.0	0.1	0.0
450070002	7	0.0	0.0	0.1	0.0
453340001	17	0.0	0.0	0.0	0.0
454010001	35	0.0	0.0	0.1	0.0
450220002	8	0.0	0.0	0.2	0.1
450220004	83	0.0	0.0	0.2	0.0
450220005	31	0.0	0.0	0.0	0.0
450220006	40	0.0	0.0	0.1	0.0
450220007	36	0.0	0.0	0.1	0.0
450220008	42	0.0	0.0	0.7	0.1
450220010	7	0.0	0.0	0.0	0.0
450670001	30	0.0	0.0	0.1	0.0
454640001	38	0.0	0.0	0.1	0.0
455210001	7	0.0	0.0	0.0	0.0
455210002	8	0.0	0.0	0.0	0.0
455370001	29	0.0	0.0	0.1	0.0
455370007	33	0.0	0.0	0.1	0.0
452320001	44	0.0	0.0	0.0	0.0
453140001	4	0.0	0.0	0.0	0.0
453390001	37	0.0	0.0	0.1	0.0
454600001	43	0.0	0.0	0.1	0.0
450720001	21	0.0	0.0	0.1	0.0
451150001	16	0.0	0.0	0.0	0.0
451150003	46	0.0	0.0	0.0	0.0
451150004	34	0.0	0.0	0.1	0.0
451150019	18	0.0	0.0	0.1	0.0
450440001	43	0.0	0.0	0.0	0.0
453620001	19	0.0	0.0	0.1	0.0
453910001	41	0.0	0.0	0.1	0.0
454560001	23	0.0	0.0	0.0	0.0
450060001	33	0.0	0.0	0.1	0.0
450320001	39	0.0	0.0	0.1	0.0
450320002	42	0.0	0.0	0.1	0.0
450320003	39	0.0	0.0	0.1	0.0
450860001	37	0.0	0.0	0.0	0.0
450860002	42	0.0	0.0	0.0	0.0
450860004	43	0.0	0.0	0.0	0.0
450950002	37	0.0	0.0	0.2	0.0
451980001	43	0.0	0.0	0.1	0.0
452330003	34	0.0	0.0	0.0	0.0
452330004	38	0.0	0.0	0.0	0.0
452330005	37	0.0	0.0	0.1	0.0
452330006	38	0.0	0.0	0.1	0.0
452560034	30	0.0	0.0	0.1	0.0
453130002	35	0.0	0.0	0.1	0.0
453170001	20	0.0	0.0	0.0	0.0
454060006	32	0.0	0.0	0.0	0.0

PARAMETER: CHROMIUM

METHOD: X-RAY FLUORESCENCE
UNITS: MICROGRAMS/CUBIC METER

YEAR: 1973

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
454890001	39	0.0	0.0	0.1	0.0
455170011	27	0.0	0.0	0.0	0.0
455195001	38	0.0	0.0	0.0	0.0
450170001	31	0.0	0.0	0.0	0.0
450170002	43	0.0	0.0	0.2	0.0
450170003	19	0.0	0.0	0.0	0.0
450170004	29	0.0	0.0	0.0	0.0
451310045	12	0.0	0.0	0.0	0.0
451410001	24	0.0	0.0	0.0	0.0
451880001	44	0.0	0.0	0.0	0.0
452130001	40	0.0	0.0	0.0	0.0
452130002	38	0.0	0.0	0.1	0.0
455420002	12	0.0	0.0	0.0	0.0
451580003	34	0.0	0.0	0.0	0.0
450330001	11	0.0	0.0	0.1	0.0
453830003	12	0.0	0.0	0.0	0.0
453950002	29	0.0	0.0	0.1	0.0
454190006	79	0.0	0.0	0.1	0.0
451700002	37	0.0	0.0	0.0	0.0
451700027	10	0.0	0.0	0.0	0.0
453770001	3	0.0	0.0	0.0	0.0
455160001	41	0.0	0.0	0.1	0.0
455240002	31	0.0	0.0	0.1	0.0

PARAMETER: CHROMIUM

METHOD: X-RAY FLUORESCENCE
UNITS: MICROGRAMS/CUBIC METER

YEAR: 1974

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
450010001	40	0.0	0.0	0.0	0.0
450660001	38	0.0	0.0	0.0	0.0
455560002	17	0.0	0.0	0.0	0.0
450070002	10	0.0	0.0	0.0	0.0
453340001	14	0.0	0.0	0.0	0.0
454010001	6	0.0	0.0	0.0	0.0
450220004	154	0.0	0.0	0.6	0.1
450220005	53	0.0	0.0	0.0	0.0
450220006	48	0.0	0.0	0.0	0.0
450220007	52	0.0	0.0	0.0	0.0
450220008	51	0.0	0.0	0.0	0.0
450220010	18	0.0	0.0	0.0	0.0
450670001	53	0.0	0.0	0.0	0.0
454640001	54	0.0	0.0	0.0	0.0
455210001	18	0.0	0.0	0.0	0.0
455210002	115	0.0	0.0	0.0	0.0
455370001	1	0.0	0.0	0.0	
455370007	20	0.0	0.0	0.1	0.0
452320001	50	0.0	0.0	0.1	0.0
453140001	5	0.0	0.0	0.0	0.0
453390001	42	0.0	0.0	0.0	0.0
454600001	43	0.0	0.0	0.0	0.0
450720001	31	0.0	0.0	0.0	0.0
451150001	19	0.0	0.0	0.0	0.0
451150003	48	0.0	0.0	0.0	0.0
451150004	49	0.1	0.0	1.1	0.2
451150019	46	0.0	0.0	0.1	0.0
450440001	40	0.0	0.0	0.0	0.0
453620001	8	0.0	0.0	0.0	0.0
453910001	24	0.0	0.0	0.0	0.0
454560001	23	0.0	0.0	0.0	0.0
450060001	44	0.0	0.0	0.0	0.0
450320001	34	0.0	0.0	0.0	0.0
450320002	35	0.0	0.0	0.0	0.0
450320003	16	0.0	0.0	0.0	0.0
450860001	20	0.0	0.0	0.1	0.0
450860002	7	0.0	0.0	0.0	0.0
450860004	2	0.0	0.0	0.0	0.0
450950002	51	0.0	0.0	0.0	0.0
451980001	26	0.0	0.0	0.1	0.0
452330003	41	0.0	0.0	0.2	0.0
452330004	41	0.0	0.0	0.1	0.0
452330005	45	0.0	0.0	0.2	0.0
452330006	44	0.0	0.0	0.3	0.0
452560034	29	0.0	0.0	0.0	0.0
453130002	42	0.0	0.0	0.0	0.0
453170001	19	0.0	0.0	0.0	0.0
454060006	41	0.0	0.0	0.0	0.0
454890001	31	0.0	0.0	0.0	0.0

PARAMETER: CHROMIUM

METHOD: X-RAY FLUORESCENCE
UNITS: MICROGRAMS/CUBIC METER

YEAR: 1974

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
455170011	56	0.0	0.0	0.0	0.0
455195001	43	0.0	0.0	0.0	0.0
450170001	10	0.0	0.0	0.0	0.0
450170002	16	0.1	0.0	1.0	0.2
450170004	8	0.0	0.0	0.0	0.0
451310045	33	0.0	0.0	0.0	0.0
451410001	22	0.0	0.0	0.0	0.0
451880001	49	0.0	0.0	0.0	0.0
452130001	57	0.0	0.0	0.1	0.0
452130002	50	0.0	0.0	0.1	0.0
455420002	39	0.0	0.0	0.0	0.0
451580003	53	0.0	0.0	0.0	0.0
450330001	9	0.0	0.0	0.0	0.0
453830003	34	0.0	0.0	0.0	0.0
453950002	18	0.0	0.0	0.0	0.0
454190006	27	0.0	0.0	0.0	0.0
451700002	32	0.0	0.0	0.0	0.0
451700027	51	0.0	0.0	0.0	0.0
453770001	37	0.0	0.0	0.0	0.0
455160001	52	0.0	0.0	0.1	0.0
455240002	52	0.0	0.0	0.0	0.0
450220012	19	0.0	0.0	0.0	0.0
450650002	34	0.0	0.0	0.0	0.0
450650003	51	0.0	0.0	0.0	0.0
450750001	3	0.0	0.0	0.0	0.0
452460002	4	0.0	0.0	0.0	0.0
452460003	3	0.0	0.0	0.0	0.0
452460004	3	0.0	0.0	0.0	0.0
455460001	3	0.0	0.0	0.0	0.0
456000004	19	0.0	0.0	0.0	0.0
456000005	12	0.0	0.0	0.0	0.0
450440002	8	0.0	0.0	0.0	0.0
450950003	3	0.0	0.0	0.0	0.0
452330024	17	0.0	0.0	0.0	0.0
455170002	12	0.0	0.0	0.0	0.0
451744001	8	0.0	0.0	0.0	0.0
452670001	8	0.0	0.0	0.0	0.0
453210001	12	0.0	0.0	0.0	0.0
454790003	28	0.0	0.0	0.0	0.0
455070001	2	0.0	0.0	0.0	0.0
451380002	9	0.0	0.0	0.0	0.0
454570036	27	0.0	0.0	0.9	0.2
456000001	25	0.0	0.0	0.0	0.0
456000002	21	0.0	0.0	0.0	0.0
456000003	20	0.0	0.0	0.0	0.0
456000006	2	0.0	0.0	0.0	0.0
455480001	24	0.0	0.0	0.0	0.0
450050001	9	0.0	0.0	0.0	0.0
451270001	10	0.0	0.0	0.0	0.0

PARAMETER: CHROMIUM

METHOD: X-RAY FLUORESCENCE
UNITS: MICROGRAMS/CUBIC METER

YEAR: 1974

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
451700028	17	0.0	0.0	0.0	0.0
451710004	6	0.0	0.0	0.0	0.0
451710005	19	0.0	0.0	0.0	0.0
451710006	26	0.0	0.0	0.0	0.0
452740001	12	0.0	0.0	0.0	0.0
452740002	6	0.0	0.0	0.0	0.0

PARAMETER: LEAD

METHOD: ATOMIC ABSORPTION
UNITS: MICROGRAMS/CUBIC METER

YEAR: 1973

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
450220004	170	1.5	0.0	7.3	0.9
455210002	94	0.2	0.0	0.6	0.1
451935001	3	0.8	0.5	0.9	0.2
451990025	3	0.5	0.4	0.7	0.2
453070024	3	0.8	0.6	1.1	0.3
453170026	4	0.8	0.5	1.2	0.3
455170003	4	0.8	0.5	1.1	0.3
455170004	4	0.4	0.4	0.6	0.1
455170011	4	1.1	0.6	1.4	0.4
455170043	4	1.1	0.1	2.1	0.8
455170045	2	0.6	0.4	0.8	0.3
451880006	103	0.8	0.0	2.4	0.4
451880012	98	0.8	0.0	2.9	0.5
451880019	104	0.7	0.1	2.1	0.3

PARAMETER: LEAD

METHOD: ATOMIC ABSORPTION
UNITS: MICROGRAMS/CUBIC METER

YEAR: 1974

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
455210002	36	0.1	0.0	0.4	0.1
451880006	105	0.7	0.1	3.1	0.4
451880012	98	0.8	0.3	4.2	0.5
451880019	71	0.7	0.2	1.4	0.2
451880016	107	1.0	0.1	2.2	0.5

PARAMETER: LEAD

METHOD: ATOMIC ABSORPTION
UNITS: MICROGRAMS/CUBIC METER

YEAR: 1973

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
450220004	170	1.5	0.0	7.3	0.9
455210002	94	0.2	0.0	0.6	0.1
451935001	3	0.8	0.5	0.9	0.2
451990025	3	0.5	0.4	0.7	0.2
453070024	3	0.8	0.6	1.1	0.3
453170026	4	0.8	0.5	1.2	0.3
455170003	4	0.8	0.5	1.1	0.3
455170004	4	0.4	0.4	0.6	0.1
455170011	4	1.1	0.6	1.4	0.4
455170043	4	1.1	0.1	2.1	0.8
455170045	2	0.6	0.4	0.8	0.3
451880006	103	0.8	0.0	2.4	0.4
451880012	98	0.8	0.0	2.9	0.5
451880019	104	0.7	0.1	2.1	0.3

PARAMETER: LEAD

METHOD: X-RAY FLUORESCENCE
UNITS: MICROGRAMS/CUBIC METER

YEAR: 1973

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
450010001	22	0.2	0.0	0.8	0.2
450660001	43	0.7	0.1	1.8	0.4
455560002	22	0.4	0.1	1.2	0.2
450070002	8	0.3	0.2	0.8	0.2
453340001	18	0.2	0.0	0.5	0.1
454010001	36	0.0	0.0	0.1	0.0
450220002	10	0.5	0.2	1.1	0.3
450220004	63	1.0	0.0	2.8	0.7
450220005	32	0.4	0.0	2.5	0.5
450220006	41	0.4	0.0	1.8	0.4
450220007	37	0.6	0.0	2.6	0.7
450220008	43	0.3	0.0	0.9	0.2
450220010	7	0.6	0.4	1.4	0.4
450670001	31	0.5	0.1	1.6	0.3
454640001	39	0.2	0.0	1.0	0.2
455210001	8	0.1	0.0	0.2	0.1
455210002	27	0.2	0.0	0.4	0.1
455370001	26	0.3	0.0	1.6	0.3
455370007	34	0.3	0.0	0.8	0.2
452320001	45	0.1	0.0	0.3	0.1
453140001	6	1.3	0.8	3.3	1.0
453390001	38	0.3	0.0	3.1	0.5
454600001	44	0.2	0.0	0.8	0.2
450720001	22	0.0	0.0	0.1	0.0
451150001	17	0.5	0.1	1.5	0.4
451150003	47	0.6	0.1	1.8	0.4
451150004	35	0.4	0.0	2.3	0.5
451150019	18	0.6	0.1	1.4	0.4
450440001	44	0.1	0.0	0.2	0.1
453620001	19	0.1	0.0	0.3	0.1
453910001	42	0.6	0.1	3.1	0.5
454560001	25	0.2	0.0	0.7	0.2
450060001	46	0.3	0.0	1.0	0.2
450320001	55	0.1	0.0	0.9	0.2
450320002	56	0.3	0.0	1.3	0.3
450320003	54	0.3	0.0	1.2	0.3
450860001	48	0.1	0.0	0.7	0.1
450860002	55	0.1	0.0	0.6	0.1
450860004	57	0.2	0.0	2.8	0.4
450950002	50	0.4	0.0	0.9	0.2
451935001	8	0.7	0.2	1.5	0.5
451980001	51	0.4	0.1	1.1	0.2
451980047	8	0.9	0.0	2.8	1.0
451990025	8	0.7	0.2	1.2	0.4
452330003	49	0.4	0.0	3.4	0.5
452330004	53	0.4	0.0	1.5	0.3
452330005	52	0.5	0.0	2.8	0.5
452330006	52	0.3	0.0	1.5	0.3
452560034	30	1.0	0.0	3.3	0.9

PARAMETER: LEAD

METHOD: X-RAY FLUORESCENCE
UNITS: MICROGRAMS/CUBIC METER

YEAR: 1973

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
453070024	5	0.5	0.0	0.7	0.3
453130002	49	0.2	0.0	1.3	0.3
453170001	24	0.2	0.0	0.5	0.2
453170026	7	0.6	0.2	1.1	0.4
454060006	47	0.2	0.0	1.7	0.3
454890001	54	0.8	0.0	2.7	0.6
455170003	8	0.9	0.4	2.5	0.7
455170004	8	0.5	0.3	0.7	0.1
455170011	38	0.6	0.1	1.4	0.4
455170043	8	1.0	0.3	2.9	1.1
455170045	6	0.2	0.0	0.5	0.2
455195001	53	0.3	0.0	1.1	0.2
450170001	32	0.3	0.0	2.5	0.5
450170002	44	0.7	0.1	1.5	0.3
450170003	20	0.3	0.0	1.0	0.3
450170004	30	0.4	0.0	1.0	0.3
451310045	12	0.4	0.1	1.0	0.2
451410001	25	0.5	0.0	1.5	0.4
451880001	45	0.7	0.2	3.4	0.5
452130001	41	0.6	0.1	1.7	0.4
452130002	39	0.5	0.0	1.4	0.4
454790002	1	1.3	1.3	1.3	
455420002	12	0.5	0.1	0.8	0.3
451580003	36	0.5	0.1	2.1	0.4
450330001	12	0.5	0.0	1.1	0.3
453830003	12	0.2	0.0	0.4	0.1
453950002	30	0.3	0.0	1.3	0.3
454190006	80	0.4	0.0	3.6	0.4
451700002	38	1.0	0.2	3.0	0.8
451700027	10	2.0	0.8	3.6	1.1
453770001	3	0.1	0.1	0.2	0.1
455160001	37	0.5	0.0	2.6	0.4
455240002	33	0.4	0.1	2.0	0.4

PARAMETER: LEAD

METHOD: X-RAY FLUORESCENCE
UNITS: MICROGRAMS/CUBIC METER

YEAR: 1974

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
450010001	40	0.2	0.0	0.6	0.1
450660001	38	0.7	0.0	1.3	0.3
455560002	17	0.3	0.0	1.0	0.3
450070002	10	0.2	0.1	0.3	0.1
453340001	14	0.1	0.0	0.6	0.2
454010001	6	0.0	0.0	0.0	0.0
450220004	154	0.7	0.0	2.1	0.4
450220005	53	0.3	0.0	1.1	0.2
450220006	48	0.4	0.0	1.2	0.3
450220007	52	0.4	0.0	1.8	0.4
450220008	51	0.3	0.0	0.9	0.2
450220010	18	0.4	0.1	0.9	0.2
450670001	53	0.4	0.1	0.9	0.2
454640001	54	0.1	0.0	0.8	0.2
455210001	18	0.1	0.0	0.2	0.1
455210002	121	0.1	0.0	0.4	0.1
455370001	1	0.5	0.5	0.5	
455370007	20	0.2	0.0	0.8	0.2
452320001	50	0.1	0.0	0.4	0.1
453140001	5	0.0	0.0	0.1	0.1
453390001	42	0.3	0.1	0.9	0.2
454600001	43	0.2	0.0	0.5	0.1
450720001	31	0.0	0.0	0.1	0.0
451150001	19	0.4	0.1	1.3	0.3
451150003	48	0.6	0.0	2.2	0.4
451150004	49	0.8	0.0	13.5	2.0
451150019	46	0.3	0.0	1.1	0.2
450440001	40	0.1	0.0	0.3	0.1
453620001	8	0.2	0.0	0.5	0.2
453910001	24	0.5	0.0	1.5	0.4
454560001	28	0.2	0.0	0.9	0.2
450060001	44	0.1	0.0	0.5	0.2
450320001	34	0.1	0.0	0.3	0.1
450320002	35	0.2	0.0	0.5	0.1
450320003	16	0.2	0.0	0.4	0.1
450860001	20	0.0	0.0	0.2	0.1
450860002	7	0.1	0.0	0.1	0.1
450860004	2	0.1	0.1	0.1	0.0
450950002	51	0.3	0.0	0.9	0.2
451935001	2	0.8	0.7	0.9	0.1
451980001	26	0.2	0.1	0.4	0.1
451980047	2	0.3	0.3	0.3	0.0
451990025	2	0.4	0.0	0.9	0.6
452330003	41	0.2	0.0	1.3	0.3
452330004	41	0.2	0.0	0.8	0.2
452330005	45	0.3	0.0	1.2	0.3
452330006	44	0.2	0.0	0.7	0.2
452560034	29	0.7	0.0	3.4	0.8
453130002	42	0.1	0.0	0.4	0.1

PARAMETER: LEAD

METHOD: X-RAY FLUORESCENCE
UNITS: MICROGRAMS/CUBIC METER

YEAR: 1974

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
453170001	19	0.2	0.0	0.6	0.2
453170026	2	0.2	0.0	0.5	0.4
454060006	41	0.2	0.0	0.7	0.2
454890001	31	0.4	0.1	2.0	0.4
455170003	2	0.7	0.6	0.9	0.2
455170004	2	0.4	0.4	0.4	0.0
455170011	56	0.5	0.0	1.0	0.2
455170043	2	0.5	0.2	0.8	0.4
455195001	43	0.1	0.0	0.4	0.1
450170001	10	0.3	0.1	1.0	0.3
450170002	16	0.6	0.2	1.1	0.3
450170004	8	0.3	0.1	0.6	0.2
451310045	33	0.4	0.1	1.5	0.3
451410001	22	0.3	0.1	1.0	0.3
451880001	49	0.5	0.0	1.4	0.3
452130001	57	0.3	0.0	1.0	0.2
452130002	50	0.3	0.0	0.9	0.2
455420002	39	0.5	0.1	1.1	0.3
451580003	53	0.5	0.0	1.8	0.4
450330001	9	0.5	0.1	1.4	0.5
453830003	34	0.2	0.0	0.7	0.2
453950002	18	0.2	0.0	0.4	0.1
454190006	27	0.2	0.0	0.5	0.1
451700002	32	0.9	0.1	1.9	0.5
451700027	51	1.3	0.2	2.5	0.5
453770001	37	0.1	0.0	0.5	0.1
455160001	52	0.4	0.0	1.1	0.3
455240002	52	0.4	0.0	1.5	0.3
450220012	19	0.2	0.0	0.5	0.1
450650002	34	0.2	0.0	0.7	0.2
450650003	51	0.1	0.0	0.4	0.1
450750001	3	0.0	0.0	0.0	0.0
452460002	4	0.1	0.0	0.2	0.1
452460003	3	0.1	0.0	0.2	0.1
452460004	3	0.0	0.0	0.0	0.0
455460001	3	0.0	0.0	0.1	0.1
456000004	19	0.2	0.0	0.7	0.2
456000005	12	0.2	0.0	0.3	0.1
450440002	8	0.1	0.0	0.1	0.1
450950003	3	0.1	0.0	0.3	0.2
452330024	17	0.4	0.0	1.1	0.3
455170002	12	0.1	0.0	0.2	0.1
451744001	8	0.4	0.0	1.2	0.4
452670001	8	0.4	0.0	0.8	0.2
453210001	12	0.3	0.0	0.9	0.2
454790003	28	0.5	0.0	1.5	0.3
455070001	2	0.2	0.0	0.5	0.4
451380002	9	0.2	0.0	0.8	0.3
454570036	27	0.4	0.1	1.2	0.3

PARAMETER: LEAD

METHOD: X-RAY FLUORESCENCE
UNITS: MICROGRAMS/CUBIC METER

YEAR: 1974

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
456000001	25	0.3	0.1	1.1	0.2
456000002	21	0.5	0.1	4.6	1.0
456000003	20	0.2	0.0	1.2	0.4
456000006	2	0.5	0.4	0.6	0.1
455480001	24	0.1	0.0	0.3	0.1
450050001	9	0.0	0.0	0.1	0.0
451270001	10	0.0	0.0	0.0	0.0
451700028	17	0.4	0.0	0.8	0.3
451710004	6	0.1	0.0	0.2	0.1
451710005	19	0.2	0.0	1.1	0.3
451710006	26	0.1	0.0	0.4	0.1
452740001	12	0.0	0.0	0.0	0.0
452740002	6	0.0	0.0	0.0	0.0

EL PASO CITY-COUNTY HEALTH DEPARTMENT

SAROAD MONTHLY DATA

PARAMETER: ARSENIC

METHOD: ATOMIC ABSORPTION
UNITS: MICROGRAMS/CUBIC METER

YEAR: 1972

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
000000001	4	0.307	0.210	0.500	0.131
900000001	5	0.299	0.100	0.684	0.228
000000002	4	0.735	0.220	1.210	0.429
900000002	5	0.961	0.190	1.840	0.714
000000003	4	0.112	0.050	0.190	0.068
900000003	5	0.096	0.050	0.163	0.043
000000004	4	0.080	0.050	0.100	0.022
900000004	5	0.077	0.037	0.106	0.026
000000005	4	0.042	0.040	0.050	0.005
900000005	5	0.055	0.023	0.100	0.029
000000006	4	0.027	0.020	0.050	0.015
900000006	5	0.045	0.000	0.093	0.035
000000007	4	0.062	0.030	0.090	0.032
900000007	5	0.081	0.019	0.143	0.051
000000008	4	0.135	0.050	0.290	0.106
900000008	5	0.127	0.066	0.292	0.093
000000009	4	0.125	0.030	0.230	0.083
900000009	5	0.120	0.042	0.180	0.060
000000010	4	0.062	0.040	0.080	0.021
900000010	5	0.129	0.030	0.290	0.101

PARAMETER: ARSENIC

METHOD: ATOMIC ABSORPTION
UNITS: MICROGRAMS/CUBIC METER

YEAR: 1973

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
000000001	13	0.6058	0.0700	3.3600	0.8898
900000001	13	0.6338	0.0400	3.1440	0.8163
000000002	13	1.2794	0.1800	3.2400	0.9260
900000002	13	0.9414	0.1340	2.4520	0.7147
000000003	12	0.1672	0.0260	0.5500	0.1385
900000003	12	0.0731	0.0180	0.3190	0.0822
000000004	12	0.1543	0.0300	0.3700	0.1025
900000004	12	0.1032	0.0270	0.2570	0.0738
000000005	12	0.0640	0.0100	0.1700	0.0494
900000005	12	0.0365	0.0110	0.0910	0.0221
000000006	12	0.0411	0.0100	0.1000	0.0246
900000006	12	0.0231	0.0090	0.0750	0.0181
000000007	12	0.1731	0.0480	0.4200	0.1125
900000007	12	0.0978	0.0200	0.2710	0.0737
000000008	12	0.1964	0.0310	0.6200	0.1703
900000008	12	0.3185	0.0500	2.2400	0.6235
000000009	11	0.1627	0.0300	0.2960	0.0979
900000009	11	0.1086	0.0130	0.2500	0.0379
000000010	11	0.1029	0.0561	0.1700	0.0415
900000010	11	0.0813	0.0220	0.1750	0.0645

PARAMETER: ARSENIC

METHOD: ATOMIC ABSORPTION
UNITS: MICROGRAMS/CUBIC METER

YEAR: 1974

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
000000001	10	0.385	0.080	0.850	0.242
900000001	10	0.238	0.051	0.447	0.172
000000002	10	1.033	0.180	2.040	0.693
900000002	10	0.551	0.113	1.136	0.372
000000003	11	0.107	0.015	0.300	0.090
900000003	11	0.060	0.017	0.119	0.039
000000004	11	0.130	0.015	0.380	0.106
900000004	11	0.070	0.008	0.141	0.050
000000005	11	0.058	0.006	0.110	0.033
900000005	11	0.036	0.011	0.058	0.014
000000006	11	0.051	0.006	0.091	0.029
900000006	11	0.030	0.003	0.060	0.018
000000007	11	0.133	0.022	0.300	0.091
900000007	11	0.076	0.019	0.144	0.041
000000008	11	0.134	0.041	0.310	0.076
900000008	11	0.076	0.037	0.164	0.036
000000009	11	0.133	0.030	0.360	0.108
900000009	11	0.068	0.008	0.156	0.054
000000010	11	0.129	0.037	0.293	0.084
900000010	11	0.071	0.020	0.195	0.059

PARAMETER: ARSENIC

METHOD: ATOMIC ABSORPTION
UNITS: MICROGRAMS/CUBIC METER

YEAR: 1975

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
000000001	3	0.360	0.069	0.586	0.265
900000001	5	0.286	0.150	0.435	0.113
000000002	3	0.162	0.105	0.214	0.055
900000002	5	0.362	0.070	0.835	0.357
000000003	3	0.104	0.084	0.115	0.017
900000003	5	0.074	0.044	0.099	0.024
000000004	3	0.114	0.090	0.139	0.025
900000004	5	0.053	0.008	0.072	0.028
000000005	3	0.258	0.027	0.706	0.388
900000005	5	0.030	0.017	0.045	0.010
000000006	3	0.046	0.029	0.076	0.026
900000006	5	0.033	0.015	0.059	0.017
000000007	3	0.158	0.071	0.211	0.076
900000007	5	0.104	0.051	0.169	0.052
000000008	3	0.161	0.149	0.177	0.015
900000008	5	0.077	0.011	0.156	0.053
000000009	3	0.059	0.019	0.087	0.036
900000009	5	0.037	0.014	0.087	0.030
000000010	3	0.078	0.004	0.207	0.112
900000010	5	0.033	0.005	0.095	0.036

PARAMETER: CADMIUM

METHOD: ATOMIC ABSORPTION
UNITS: MICROGRAMS/CUBIC METER

YEAR: 1972

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
000000001	6	0.332	0.160	0.810	0.243
900000001	7	0.302	0.147	0.816	0.234
000000002	6	0.544	0.150	0.974	0.301
900000002	6	0.522	0.160	0.932	0.293
000000003	7	0.024	0.000	0.050	0.017
900000003	6	0.045	0.008	0.079	0.027
000000004	7	0.024	0.006	0.070	0.023
900000004	6	0.032	0.014	0.050	0.017
000000005	7	0.006	0.000	0.030	0.011
900000005	6	0.035	0.017	0.060	0.014
000000006	6	0.003	0.000	0.010	0.005
900000006	6	0.022	0.011	0.040	0.012
000000007	7	0.016	0.000	0.050	0.018
900000007	6	0.036	0.012	0.070	0.024
000000008	7	0.031	0.000	0.070	0.024
900000008	6	0.051	0.009	0.081	0.028
000000009	7	0.031	0.000	0.110	0.037
900000009	6	0.053	0.020	0.120	0.036
000000010	7	0.012	0.000	0.020	0.010
900000010	6	0.030	0.005	0.049	0.016
900000011	1	0.875	0.875	0.875	
900000012	1	1.254	1.254	1.254	
900000013	1	1.129	1.129	1.129	

PARAMETER: CADMIUM

METHOD: ATOMIC ABSORPTION
UNITS: MICROGRAMS/CUBIC METER

YEAR: 1973

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
000000001	13	0.367	0.030	1.355	0.345
900000001	13	0.397	0.047	1.636	0.420
000000002	13	0.453	0.080	1.030	0.295
900000002	13	0.440	0.105	0.833	0.276
000000003	12	0.034	0.009	0.110	0.028
900000003	12	0.060	0.045	0.113	0.019
000000004	12	0.036	0.017	0.086	0.021
900000004	12	0.059	0.032	0.101	0.020
000000005	12	0.017	0.007	0.040	0.010
900000005	12	0.044	0.026	0.064	0.010
000000006	12	0.011	0.000	0.030	0.010
900000006	12	0.035	0.021	0.053	0.011
000000007	12	0.045	0.015	0.100	0.029
900000007	12	0.064	0.042	0.124	0.026
000000008	12	0.048	0.016	0.110	0.030
900000008	12	0.072	0.048	0.127	0.024
000000009	10	0.045	0.010	0.070	0.025
900000009	11	0.067	0.000	0.161	0.041
000000010	10	0.023	0.010	0.040	0.011
900000010	11	0.049	0.033	0.069	0.010

PARAMETER: CADMIUM

METHOD: ATOMIC ABSORPTION
UNITS: MICROGRAMS/CUBIC METER

YEAR: 1974

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
000000001	10	0.242	0.030	0.469	0.158
900000001	10	0.226	0.073	0.430	0.131
000000002	10	0.516	0.100	1.860	0.516
900000002	10	0.416	0.104	0.880	0.283
000000003	11	0.033	0.006	0.100	0.030
900000003	11	0.058	0.009	0.140	0.043
000000004	11	0.035	0.008	0.080	0.024
900000004	11	0.066	0.006	0.181	0.056
000000005	11	0.022	0.006	0.040	0.010
900000005	11	0.041	0.008	0.077	0.027
000000006	11	0.014	0.010	0.030	0.006
900000006	11	0.034	0.008	0.063	0.019
000000007	11	0.039	0.002	0.070	0.026
900000007	11	0.067	0.012	0.124	0.047
000000008	11	0.044	0.014	0.090	0.027
900000008	11	0.062	0.012	0.114	0.039
000000009	11	0.034	0.010	0.080	0.026
900000009	11	0.056	0.014	0.133	0.040
000000010	11	0.026	0.010	0.061	0.017
900000010	11	0.048	0.014	0.130	0.033

PARAMETER: CADMIUM

METHOD: ATOMIC ABSORPTION
UNITS: MICROGRAMS/CUBIC METER

YEAR: 1975

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
000000001	3	0.208	0.023	0.435	0.209
900000001	5	0.248	0.028	0.530	0.192
000000002	3	0.097	0.051	0.146	0.048
900000002	5	0.320	0.059	0.989	0.388
000000003	3	0.046	0.029	0.072	0.023
900000003	5	0.046	0.023	0.078	0.025
000000004	3	0.045	0.030	0.053	0.013
900000004	5	0.041	0.034	0.059	0.010
000000005	3	0.017	0.014	0.020	0.003
900000005	5	0.022	0.008	0.041	0.015
000000006	3	0.015	0.012	0.017	0.003
900000006	5	0.023	0.012	0.036	0.011
000000007	3	0.060	0.017	0.087	0.037
900000007	5	0.063	0.025	0.097	0.027
000000008	3	0.079	0.031	0.131	0.050
900000008	5	0.060	0.005	0.123	0.044
000000009	3	0.030	0.007	0.069	0.034
900000009	5	0.030	0.006	0.065	0.024
000000010	3	0.014	0.005	0.026	0.011
900000010	5	0.022	0.008	0.033	0.011

PARAMETER: LEAD

METHOD: ATOMIC ABSORPTION
UNITS: MICROGRAMS/CUBIC METER

YEAR: 1972

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
000000001	6	10.278	4.680	18.360	5.853
900000001	7	11.113	4.160	22.990	8.234
000000002	6	9.175	3.350	14.150	4.545
900000002	6	10.398	2.860	16.620	5.386
000000003	7	1.921	0.770	3.800	1.047
900000003	6	2.043	0.946	3.788	1.050
000000004	7	2.043	0.950	3.240	0.820
900000004	6	2.208	1.402	3.452	0.767
000000005	7	0.910	0.390	1.690	0.514
900000005	6	0.994	0.629	1.540	0.393
000000006	6	0.695	0.290	1.200	0.340
900000006	6	0.761	0.449	1.200	0.300
000000007	7	1.233	0.610	2.310	0.782
900000007	6	1.341	0.776	2.359	0.672
000000008	7	1.916	0.670	4.180	1.157
900000008	6	2.021	0.900	3.970	1.092
000000009	7	1.647	0.640	3.550	1.081
900000009	6	1.680	0.789	3.180	1.006
000000010	7	0.901	0.360	1.800	0.547
900000010	6	1.068	0.600	2.029	0.558
900000011	1	7.149	7.149	7.149	
900000012	1	2.188	2.188	2.188	
900000013	1	19.330	19.330	19.330	

PARAMETER: LEAD

METHOD: ATOMIC ABSORPTION
UNITS: MICROGRAMS/CUBIC METER

YEAR: 1973

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
000000001	13	14.225	1.440	59.280	15.968
900000001	13	14.313	1.631	61.000	16.156
000000002	13	8.263	2.390	18.870	5.546
900000002	13	8.238	2.188	17.740	5.428
000000003	12	1.887	0.704	3.720	0.964
900000003	12	1.846	0.734	3.972	0.890
000000004	12	2.149	0.900	3.140	0.722
900000004	12	2.125	1.297	3.177	0.699
000000005	12	1.045	0.350	2.420	0.639
900000005	12	1.107	0.536	2.015	0.514
000000006	12	0.822	0.270	1.770	0.452
900000006	12	0.904	0.370	1.800	0.432
000000007	12	1.695	0.764	2.700	0.645
900000007	12	1.650	0.758	2.513	0.587
000000008	12	2.136	0.967	4.360	0.969
900000008	12	2.120	0.870	4.301	0.981
000000009	10	1.907	0.660	3.150	0.643
900000009	11	1.673	0.663	3.087	0.645
000000010	10	1.167	0.450	2.470	0.565
900000010	11	1.194	0.520	2.821	0.603

PARAMETER: LEAD

METHOD: ATOMIC ABSORPTION
UNITS: MICROGRAMS/CUBIC METER

YEAR: 1974

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
000000001	10	7.973	1.210	19.650	5.942
900000001	10	7.398	1.418	16.810	5.358
000000002	10	6.452	1.560	12.200	3.936
900000002	10	7.159	1.680	15.840	4.430
000000003	11	1.608	0.590	3.310	0.919
900000003	11	1.445	0.669	2.977	0.783
000000004	11	2.121	0.760	3.550	1.011
900000004	11	1.996	0.881	3.419	0.972
000000005	11	0.957	0.360	2.060	0.496
900000005	11	0.872	0.372	1.636	0.406
000000006	11	0.745	0.340	1.530	0.363
900000006	11	0.678	0.338	1.345	0.311
000000007	11	1.595	0.680	2.380	0.597
900000007	11	1.500	0.734	2.261	0.605
000000008	11	1.696	0.900	2.970	0.718
900000008	11	1.541	0.725	2.633	0.646
000000009	11	1.372	0.610	2.630	0.640
900000009	11	1.309	0.595	2.874	0.704
000000010	11	0.831	0.110	1.280	0.368
900000010	11	0.784	0.459	1.173	0.250

PARAMETER: LEAD

METHOD: ATOMIC ABSORPTION
UNITS: MICROGRAMS/CUBIC METER

YEAR: 1975

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
000000001	3	3.863	1.110	5.720	2.432
900000001	5	4.959	1.030	10.490	3.448
000000002	3	2.083	1.680	2.430	0.378
900000002	5	3.875	1.564	9.877	3.490
000000003	3	1.823	1.370	2.120	0.399
900000003	5	1.403	1.042	1.793	0.366
000000004	3	2.110	1.860	2.440	0.298
900000004	5	1.710	1.346	2.020	0.291
000000005	3	1.010	0.850	1.190	0.171
900000005	5	0.798	0.511	1.030	0.198
000000006	3	0.987	0.810	1.140	0.166
900000006	5	0.704	0.515	0.947	0.193
000000007	3	1.753	1.090	2.170	0.581
900000007	5	1.668	1.011	2.433	0.562
000000008	3	2.250	1.630	2.780	0.580
900000008	5	1.632	1.309	2.215	0.394
000000009	3	1.000	0.880	1.120	0.120
900000009	5	0.974	0.856	1.046	0.076
000000010	3	0.593	0.560	0.640	0.042
900000010	5	0.584	0.492	0.730	0.093

PARAMETER: ZINC

METHOD: ATOMIC ABSORPTION
UNITS: MICROGRAMS/CUBIC METER

YEAR: 1972

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
000000001	6	5.232	2.480	10.350	3.071
900000001	7	4.687	2.580	9.237	2.652
000000002	6	7.848	3.180	13.600	3.854
900000002	6	8.656	2.570	15.280	4.879
000000003	7	0.791	0.250	1.710	0.545
900000003	6	0.692	0.163	1.654	0.598
000000004	7	0.632	0.260	1.270	0.379
900000004	6	0.539	0.308	0.922	0.251
000000005	7	0.360	0.190	0.800	0.210
900000005	6	0.331	0.186	0.570	0.153
000000006	6	0.153	0.030	0.370	0.127
900000006	6	0.195	0.091	0.420	0.126
000000007	7	0.566	0.180	1.510	0.485
900000007	6	0.974	0.222	2.770	0.951
000000008	7	0.970	0.290	2.480	0.768
900000008	6	0.885	0.229	2.171	0.705
000000009	7	0.854	0.210	2.280	0.712
900000009	6	0.982	0.310	2.660	0.856
000000010	7	0.539	0.130	0.930	0.297
900000010	6	0.561	0.302	0.870	0.198
900000011	1	5.310	5.310	5.310	
900000012	1	81.390	81.390	81.390	
900000013	1	7.390	7.390	7.390	

PARAMETER: ZINC

METHOD: ATOMIC ABSORPTION
UNITS: MICROGRAMS/CUBIC METER

YEAR: 1973

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
000000001	13	6.224	0.620	23.340	6.049
900000001	13	6.188	0.482	25.380	6.548
000000002	13	6.617	1.790	12.450	4.040
900000002	13	6.608	1.633	15.450	4.554
000000003	12	0.770	0.080	2.090	0.521
900000003	12	0.708	0.212	1.584	0.430
000000004	12	0.671	0.239	1.130	0.321
900000004	12	0.727	0.308	1.099	0.326
000000005	12	0.378	0.040	0.880	0.286
900000005	12	0.379	0.080	1.022	0.258
000000006	12	0.196	0.030	0.360	0.103
900000006	12	0.238	0.070	0.410	0.103
000000007	12	0.868	0.222	1.650	0.497
900000007	12	0.890	0.283	1.522	0.464
000000008	12	0.964	0.182	1.980	0.555
900000008	12	0.997	0.266	2.113	0.602
000000009	10	0.765	0.180	1.160	0.342
900000009	11	0.698	0.052	1.368	0.369
000000010	10	0.505	0.340	0.690	0.102
900000010	11	0.506	0.314	0.731	0.154

PARAMETER: ZINC

METHOD: ATOMIC ABSORPTION
UNITS: MICROGRAMS/CUBIC METER

YEAR: 1974

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
000000001	10	3.382	0.500	7.110	2.220
900000001	10	3.094	0.683	5.590	1.964
000000002	10	4.905	0.730	9.630	2.894
900000002	10	5.016	0.841	13.170	3.886
000000003	11	0.599	0.120	1.450	0.506
900000003	11	0.535	0.122	1.461	0.421
000000004	11	0.630	0.090	1.190	0.377
900000004	11	0.680	0.088	1.548	0.473
000000005	11	0.310	0.090	0.680	0.181
900000005	11	0.305	0.104	0.540	0.139
000000006	11	0.250	0.060	0.570	0.135
900000006	11	0.237	0.096	0.461	0.117
000000007	11	0.703	0.140	1.390	0.436
900000007	11	0.734	0.183	1.380	0.456
000000008	11	0.700	0.270	1.450	0.433
900000008	11	0.635	0.225	1.114	0.354
000000009	11	0.641	0.120	1.840	0.535
900000009	11	0.608	0.115	1.806	0.547
000000010	11	0.476	0.160	1.080	0.299
900000010	11	0.410	0.150	0.878	0.242

PARAMETER: ZINC

METHOD: ATOMIC ABSORPTION
UNITS: MICROGRAMS/CUBIC METER

YEAR: 1975

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
000000001	3	2.760	0.510	4.570	2.065
900000001	5	2.919	0.442	5.216	1.832
000000002	3	1.387	0.710	2.180	0.742
900000002	5	3.381	1.136	9.014	3.331
000000003	3	0.907	0.510	1.290	0.390
900000003	5	0.753	0.441	1.091	0.296
000000004	3	1.023	0.500	1.870	0.740
900000004	5	0.731	0.390	1.384	0.399
000000005	3	0.247	0.240	0.260	0.012
900000005	5	0.228	0.088	0.357	0.098
000000006	3	0.350	0.090	0.630	0.271
900000006	5	0.215	0.103	0.418	0.128
000000007	3	1.207	0.390	2.110	0.863
900000007	5	0.918	0.319	1.552	0.502
000000008	3	1.097	0.720	1.690	0.520
900000008	5	0.798	0.160	1.450	0.470
000000009	3	0.203	0.170	0.260	0.049
900000009	5	0.347	0.153	0.572	0.170
000000010	3	0.143	0.090	0.190	0.050
900000010	5	0.201	0.041	0.377	0.121

EL PASO CITY-COUNTY HEALTH DEPARTMENT

SOIL AND DUST DATA

PARAMETER: ARSENIC

METHOD: ATOMIC ABSORPTION
UNITS: PARTS PER MILLION

YEAR: 1972

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
1ALAMO	2	10	10	10	0
1ADY	2	15	10	20	7
1BOWIE	3	47	10	120	64
1CORONADO	2	10	10	10	0
1CRISTOREY	5	379	20	768	320
1ELPASOHIG	3	18	5	40	19
1HART	2	10	10	10	0
1HOLYFAMIL	4	50	10	90	41
1JESUS&MAR	4	47	20	58	18
1LAMAR	3	63	10	140	68
1LINCOLN	2	33	25	40	11
1MESITA	4	93	10	300	139
1MOREHEAD	2	25	10	40	21
1PUTNAM	2	10	10	10	0
1ROBERTS	2	25	10	40	21
1ROOSEVELT	3	57	30	100	38
1SACREDHEA	3	36	30	47	10
1SANJACINT	3	33	10	80	40
1STCLEMENT	4	45	10	120	52
1STIGNATIO	4	23	10	40	15
1STMICHAEL	3	25	10	40	15
1STPATRICK	4	58	15	162	70
1UTEP	4	45	10	120	52
1VILAS	4	100	10	300	137
1WESTERNHI	3	35	10	80	39
1WHITE	2	10	10	10	0
11100MADEL	3	38	10	80	37
1113RITODE	3	183	64	300	118
1119ACARLO	2	145	70	220	106
1120WILLIE	1	60	60	60	
11218RANDO	4	41	10	120	53
11409MUNDY	4	85	45	120	37
1148COURCH	2	40	40	40	0
11730WPAIS	2	75	10	140	92
11838WPAIS	3	25	10	40	15
11844WPAIS	2	53	25	80	39
1204WILLIE	2	152	64	240	124
1216ACARLO	1	80	80	80	
12473VFW	5	141	40	300	97
12510STVRA	2	26	10	42	23
12616PAISA	5	152	84	320	98
13210PIEDM	2	30	20	40	14

PARAMETER: ARSENIC

METHOD: ATOMIC ABSORPTION
UNITS: PARTS PER MILLION

YEAR: 1973

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
1ALAMO	12	7	3	20	5
1AOY	12	7	2	20	5
1BOWIE	12	7	2	30	8
1CORONADO	12	6	2	10	3
1CRISTOREY	12	316	130	630	146
1ELPASOHIG	12	18	3	40	12
1HART	12	9	2	25	7
1HOLYFAMIL	12	10	3	25	8
1JESUS&MAR	12	28	3	55	19
1KERNFIRFS	1	35	35	35	
1LAMAR	12	7	3	15	4
1LINCOLN	12	6	2	10	3
1MESITA	12	7	3	10	3
1MOREHEAD	12	6	2	10	3
1PUTNAM	12	6	2	10	3
1ROBERTS	12	6	2	10	3
1ROOSEVELT	12	11	3	25	7
1SACREDHEA	12	33	3	230	63
1SANJACINT	12	9	2	26	7
1STCLEMENT	12	30	3	87	26
1STIGNATIO	12	17	2	45	16
1STMICHAEL	12	5	2	10	3
1STPATRICK	12	26	3	85	25
1UTEP	12	14	2	28	9
1VILAS	11	9	3	20	5
1WESTERNHI	11	6	3	10	2
1WHITE	11	7	3	15	4
11100MADEL	2	8	5	10	4
11218RANDO	12	14	3	45	15
11409MUNDY	12	16	2	50	18
1148COURCH	12	7	3	13	3
11730WPAIS	12	5	2	10	2
11838WPAIS	12	7	2	20	5
11844WPAIS	12	10	2	35	10
12473VFW	12	125	5	400	105
12510STVRA	12	10	3	30	9
12616PAISA	12	140	30	280	63
1301ROBINS	9	16	3	35	10
13210PIEDM	12	7	3	17	4

PARAMETER: ARSENIC

METHOD: ATOMIC ABSORPTION
UNITS: PARTS PER MILLION

YEAR: 1974

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
1ALAMO	12	8	2	14	3
1ACY	12	11	5	18	5
1BOWIE	12	9	5	16	3
1BUENAVIST	12	83	4	670	190
1CORONADO	12	4	1	7	2
1CHRISTOREY	12	192	6	420	142
1ELPASOHIG	12	27	13	44	10
1HART	12	9	3	20	5
1HOLYFAMIL	12	26	12	44	11
1JESUS&MAR	12	38	11	78	20
1LAMAR	12	7	4	11	3
1LINCOLN	12	3	1	5	1
1MESITA	12	21	9	120	31
1MOREHEAD	12	4	1	8	2
1PUTNAM	12	4	1	7	2
1ROBERTS	12	6	1	31	8
1ROOSEVELT	12	12	4	19	5
1SACREDHEA	12	21	12	30	6
1SANJACINT	12	14	5	21	5
1STCLEMENT	12	13	5	27	6
1STIGNATIO	8	22	18	30	4
1STMICHAEL	7	3	1	5	1
1STPATRICK	12	26	12	40	9
1UTEP	12	27	16	39	9
1VILAS	12	16	8	29	6
1WESTERNHI	12	6	1	25	6
1WHITE	12	12	5	20	4
11218RANDO	12	29	7	54	15
11409MUNDY	12	26	12	44	11
11730WPAIS	12	20	11	85	21
11838WPAIS	12	24	6	85	22
11844WPAIS	12	31	17	100	23
12473VFW	11	229	24	702	202
12510STVRA	12	18	4	55	13
12616PAISA	12	199	24	380	124
1301ROBINS	12	42	17	165	40

PARAMETER: ARSENIC

METHOD: ATOMIC ABSORPTION
UNITS: PARTS PER MILLION

YEAR: 1975

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
1ALAMO	3	12	10	15	3
1AOY	3	13	8	18	5
1BOWIE	3	12	8	19	6
1BUENAVIST	3	22	10	45	20
1CORONADO	3	9	5	15	6
1CRISTOREY	3	553	357	651	169
1ELPASOHIG	3	64	36	120	48
1HART	3	7	5	9	2
1HOLYFAMIL	3	31	25	35	6
1JESUS&MAR	3	37	11	51	22
1LAMAR	3	46	11	110	55
1LINCOLN	3	8	5	13	5
1MESITA	3	17	13	20	4
1MOREHEAD	3	5	5	6	1
1PUTNAM	3	17	5	40	20
1ROBERTS	3	5	4	5	1
1ROOSEVELT	2	9	5	13	6
1SACREDHEA	3	29	21	35	7
1SANJACINT	3	18	17	18	1
1STCLEMENT	3	13	12	14	1
1STPATRICK	3	26	18	33	8
1UTEP	3	23	4	32	16
1VILAS	3	25	12	46	19
1WESTERNHI	3	34	5	92	50
1WHITE	3	14	8	18	6
11218RANDO	2	47	39	54	11
11409MUNDY	3	29	19	44	13
11730WPAIS	3	14	7	18	6
11838WPAIS	3	14	5	19	8
11844WPAIS	3	21	15	26	6
12473VFW	3	434	286	651	192
12510STVRA	3	20	18	23	3
12616PAISA	3	336	200	455	128
1301ROBINS	3	13	9	18	5

PARAMETER: ARSENIC

METHOD: ATOMIC ABSORPTION
UNITS: PARTS PER MILLION

YEAR: 1972

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
1329VISTAH	3	31	17	50	17
13407ZAPAL	2	10	10	10	0
1701TURNEY	3	27	10	60	29
1706SHILLS	3	37	10	80	38
1710MCKELL	1	35	35	35	
17107THSTR	4	49	10	132	56
1805SKANSA	1	10	10	10	
1825MUNDY	2	45	10	80	49
2ALAMO	3	14	12	15	2
2AOY	3	18	14	21	4
2BOWIE	3	14	11	18	4
2CORONADO	3	6	4	8	2
2CRISTOREY	3	495	306	700	197
2ELPASOHIG	3	13	9	18	5
2HART	3	16	14	18	2
2HOLYFAMIL	3	38	27	51	12
2JESUS&MAR	3	63	52	78	14
2LAMAR	3	7	5	8	2
2LINCOLN	3	6	6	6	0
2MESITA	3	14	12	16	2
2MOREHEAD	3	4	3	6	2
2PUTNAM	3	6	5	7	1
2ROBERTS	3	5	4	5	1
2ROOSEVELT	3	26	26	27	1
2SACREDHEA	3	36	34	38	2
2SANJACINT	3	16	13	18	3
2STCLEMENT	3	59	45	67	12
2STIGNATIO	3	43	38	50	6
2STMICHAEL	3	5	4	7	2
2STPATRICK	3	62	54	70	8
2UTEP	3	27	26	29	2
2VILAS	3	26	22	29	4
2WESTERNHI	3	4	3	6	2
2WHITE	3	22	20	26	3
21100MADEL	3	23	15	36	12
2113PITOPE	1	232	232	232	
2119ACARLO	1	92	92	92	
2120WILLIF	1	82	82	82	
21218RANCU	3	41	37	46	5
21409MUNDY	3	66	58	75	9
2143CHURCH	3	22	21	22	1
21730WPAIS	3	20	17	22	3
21838WPAIS	3	22	18	24	3

PARAMETER: ARSENIC

METHOD: ATOMIC ABSORPTION
UNITS: PARTS PER MILLION

YEAR: 1973

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
1329VISTAH	12	6	2	17	4
13407ZAPAL	12	5	2	10	2
1701TURNEY	1	5	5	5	
1706SHILLS	11	7	3	13	3
1708MCKELL	9	5	2	10	2
17107THSTR	12	5	2	10	3
1825MUNDY	12	7	3	10	3
2ALAMO	12	16	2	34	9
2AOY	12	21	13	35	8
2BOWIE	12	23	5	80	22
2CORONADO	12	6	2	10	2
2CRISTOREY	11	370	162	670	162
2ELPASOHIG	12	28	5	54	15
2HART	12	17	1	34	10
2HOLYFAMIL	12	41	22	60	10
2JESUS&MAR	12	58	37	100	18
2KERNFIRES	1	73	73	73	
2LAMAR	12	14	7	29	7
2LINCOLN	12	6	3	11	2
2MESITA	12	18	10	55	12
2MOREHEAD	12	5	1	10	2
2PUTNAM	12	9	2	53	14
2ROBERTS	12	5	1	12	3
2ROOSEVELT	12	32	14	88	19
2SACREDHEA	12	59	26	336	87
2SANJACINT	11	22	10	36	8
2STCLEMENT	12	45	18	114	28
2STIGNATIO	12	48	28	72	13
2STMICHAEL	12	17	0	79	24
2STPATRICK	12	49	15	74	16
2UTEP	12	38	14	82	18
2VILAS	11	34	25	47	9
2WESTERNHI	11	6	3	9	2
2WHITE	11	16	8	23	5
21100MADEL	2	14	13	14	1
21218RANDO	12	31	5	55	17
21409MUNDY	12	88	34	384	94
2148COURCH	12	25	18	37	6
21730WPAIS	12	23	15	38	7
21838WPAIS	12	26	13	37	6

PARAMETER: ARSENIC

METHOD: ATOMIC ABSORPTION
UNITS: PARTS PER MILLION

YEAR: 1974

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
1329VISTAH	11	19	6	65	16
13407ZAPAL	11	10	4	30	6
1708MCKELL	12	26	15	85	19
17107THSTR	12	7	3	14	4
1825MUNDY	10	12	1	21	7
2ALAMO	12	12	8	20	3
2ADY	12	17	6	27	6
2BOWIE	12	14	9	27	5
2BUENAVIST	12	77	8	640	178
2CORONADO	12	4	2	7	1
2CRISTOREY	12	339	1	845	236
2ELPASOHIG	12	39	29	52	8
2HART	12	14	5	24	7
2HOLYFAMIL	12	43	23	76	14
2JESUS&MAR	12	50	2	77	19
2LAMAR	12	9	6	13	2
2LINCOLN	12	3	2	5	1
2MESITA	12	16	11	22	4
2MOREHEAD	12	4	2	7	2
2PUTNAM	12	5	3	9	2
2ROBERTS	12	3	2	5	1
2ROOSEVELT	12	18	11	28	5
2SACREDHEA	12	31	22	38	5
2SANJACINT	12	23	17	29	4
2STCLEMENT	12	18	7	36	10
2STIGNATIO	8	40	29	46	6
2STMICHAEL	7	4	2	6	1
2STPATRICK	12	39	22	64	11
2UTEP	12	45	25	83	16
2VILAS	12	23	13	43	9
2WESTERNHI	12	5	2	7	2
2WHITE	12	17	12	22	3
2121BRANDO	12	39	1	81	24
21409MUNDY	12	40	24	68	15
21730WPAIS	12	17	12	22	4
21838WPAIS	12	36	14	218	57

PARAMETER: ARSENIC

METHOD: ATOMIC ABSORPTION
UNITS: PARTS PER MILLION

YEAR: 1975

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
1329VISTAH	1	10	10	10	
1708MCKELL	3	16	10	20	6
17107THSTP	3	10	5	18	7
1825MUNDY	1	23	23	23	
2ALAMO	3	14	4	19	8
2ADY	3	16	11	22	6
2BOWIE	3	12	6	21	8
2BUENAVIST	3	29	6	68	34
2CORONADO	2	7	6	7	1
2CRISTOREY	3	910	695	1250	298
2ELPASOHIG	3	66	33	120	47
2HART	3	6	4	10	3
2HOLYFAMIL	3	37	31	45	7
2JESUS&MAR	3	39	9	54	26
2LAMAR	3	9	2	14	6
2LINCOLN	2	3	2	4	1
2MESITA	3	14	12	17	3
2MOREHEAD	2	5	4	5	1
2PUTNAM	2	4	3	5	1
2ROBERTS	2	4	3	5	1
2ROOSEVELT	1	20	20	20	
2SACREDHEA	3	29	20	34	8
2SANJACINT	3	23	22	24	1
2STCLEMENT	3	11	6	14	4
2STPATRICK	3	25	12	32	11
2UTEP	2	41	35	46	8
2VILAS	3	35	12	76	36
2WESTERNHI	2	5	4	6	1
2WHITE	3	17	15	20	3
21218RANDO	2	67	63	70	5
21409MUNDY	3	36	24	54	16
21730WPAIS	3	14	2	24	11
21838WPAIS	3	15	4	24	10

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PARAMETER: ARSENIC

METHOD: ATOMIC ABSORPTION
UNITS: PARTS PER MILLION

YEAR: 1972

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
21844WPAIS	3	32	26	36	5
22473VEW	3	143	29	350	180
22510STVEA	3	21	16	27	5
22616PAISA	3	167	102	210	57
23210PIERM	2	23	19	26	5
2329VISTAH	3	22	18	26	4
23407ZAPAL	2	11	10	12	1
2701TURNEY	3	19	11	26	8
2705SHILLS	3	20	19	21	1
2710MCKELL	1	44	44	44	
27107THSTR	3	9	5	11	3
2805SKANSA	1	48	48	48	
2825MUNDY	3	25	21	30	5
3ALAMO	3	394	80	973	506
3ADY	2	38	25	50	18
3BOWIE	2	109	88	130	30
3CORONADO	2	231	220	241	15
3CRISTOREY	5	219	50	572	215
3ELPASOHIG	4	203	25	360	146
3HART	2	95	64	125	43
3HOLYFAMIL	1	150	150	150	
3JESUSEMAR	4	189	125	220	43
3LAMAR	[illegible]	317	25	575	484
3LINCOLN	1	125	125	125	
3MESITA	5	334	125	565	185
3MOREHEAD	1	50	50	50	
3PUTNAM	2	133	125	140	11
3ROBERTS	1	50	50	50	
3ROOSEVELT	4	115	65	173	55
3SACREDHEA	4	129	25	250	93
3SANJACINT	1	125	125	125	
3STCLEMENT	3	102	56	162	54
3STMICHAEL	1	25	25	25	
3STPATRICK	4	171	40	315	124
3UTEP	4	153	120	200	[illegible]
3VILAS	3	111	40	175	70
3WESTERNHI	1	368	368	368	
3WHITE	2	123	120	125	4

PARAMETER: ARSENIC

METHOD: ATOMIC ABSORPTION
UNITS: PARTS PER MILLION

YEAR: 1973

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
21844WPAIS	12	35	19	57	9
22473VFW	11	266	46	990	247
22510STVRA	12	23	12	31	8
22616PAISA	11	243	25	578	152
2301ROBINS	9	57	40	100	19
23210PIEDM	12	17	6	28	9
2329VISTAH	12	21	7	33	7
23407ZAPAL	12	15	6	36	9
2701TURNEY	1	20	20	20	
2706SHILLS	11	20	11	39	7
2708MCKELL	9	21	10	34	7
27107THSTR	12	13	6	32	7
2825MUNDY	12	21	2	48	15
3ALAMO	12	46	10	150	41
3AOY	11	65	10	306	88
3BOWIE	12	36	10	75	19
3CORONADO	11	33	14	75	18
3CRISTOREY	11	851	25	1680	572
3ELPASOHIG	12	89	25	300	91
3HART	12	31	10	75	18
3HOLYFAMIL	12	56	10	140	42
3JESUS&MAR	12	102	25	275	99
3KERNFIRES	1	50	50	50	
3LAMAR	12	54	15	140	42
3LINCOLN	12	34	10	112	27
3MESITA	12	99	25	360	100
3MOREHEAD	12	26	10	50	12
3PUTNAM	12	26	10	50	12
3ROBERTS	12	24	10	50	10
3ROOSEVELT	12	55	10	180	53
3SACREDHEA	12	88	10	301	88
3SANJACINT	11	91	10	224	81
3STCLEMENT	10	51	10	138	46
3STIGNATIO	12	44	10	127	36
3STMICHAEL	12	98	13	275	89
3STPATRICK	11	99	10	200	74
3UTEP	12	123	10	338	106
3VILAS	10	119	10	308	108
3WESTERNHI	10	35	10	130	34
3WHITE	11	49	10	114	40

PARAMETER: ARSENIC

METHOD: ATOMIC ABSORPTION
UNITS: PARTS PER MILLION

YEAR: 1974

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
21844WPAIS	12	34	22	106	23
22473VFW	11	254	1	750	228
22510STVRA	12	28	7	55	14
22616PAISA	12	214	1	386	127
2301ROBINS	12	39	18	59	12
2329VISTAH	11	28	9	58	14
23407ZAPAL	11	12	7	24	4
2708MCKELL	12	26	20	36	6
27107THSTR	12	10	3	16	4
2825MUNDY	10	18	3	47	13
3ALAMO	12	46	20	90	20
3ADY	12	85	30	145	39
3BOWIE	12	58	25	100	23
3BUENAVIST	12	56	20	113	29
3CORONADO	12	39	12	80	21
3CRISTOREY	11	1407	280	2970	1011
3ELPASOHIG	12	139	87	200	35
3HART	11	59	25	125	28
3HOLYFAMIL	11	99	25	177	47
3JESUS&MAR	11	158	80	284	65
3LAMAR	12	96	40	150	37
3LINCOLN	12	36	5	104	35
3MESITA	12	108	40	175	41
3MOREHEAD	12	16	5	25	6
3PUTNAM	12	20	10	30	7
3ROBERTS	12	15	5	25	7
3ROOSEVELT	11	94	42	170	44
3SACREDHEA	12	139	80	226	50
3SANJACINT	9	77	15	163	47
3STCLEMENT	12	116	13	272	70
3STIGNATIO	7	47	30	65	15
3STMICHAEL	6	58	25	84	24
3STPATRICK	12	155	65	240	54
3UTEP	10	142	90	210	42
3VILAS	12	148	65	232	55
3WESTERNHI	11	27	10	92	23
3WHITE	11	82	25	327	84

PARAMETER: ARSENIC

METHOD: ATOMIC ABSORPTION
UNITS: PARTS PER MILLION

YEAR: 1975

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
21844WPAIS	3	25	22	31	5
22473VFW	3	485	275	695	210
22510STVRA	3	16	11	19	5
22616PAISA	3	385	264	500	118
2301ROBINS	3	16	10	22	6
2329VISTAH	1	7	7	7	
2708MCKELL	3	15	8	26	10
27107THSTF	3	8	1	12	6
2825MUNDY	1	28	28	28	
3ALAMO	3	52	15	90	38
3ADY	3	82	30	150	62
3BOWIE	3	68	15	98	46
3BUENAVIST	3	57	50	60	6
3CORONADO	3	50	7	120	61
3CRISTOREY	3	1716	819	2758	978
3ELPASOHIG	3	288	49	470	216
3HART	3	103	15	260	136
3HOLYFAMIL	3	77	15	150	68
3JESUS&MAR	3	320	23	562	274
3LAMAR	3	85	6	235	130
3LINCOLN	3	28	5	63	31
3MESITA	3	138	90	198	55
3MOREHEAD	3	15	5	25	10
3PUTNAM	3	12	5	25	12
3ROBERTS	3	15	5	25	10
3ROOSEVELT	2	164	83	245	115
3SACREDHEA	3	218	23	330	169
3SANJACINT	2	62	15	108	66
3STCLEMENT	3	129	23	258	119
3STPATRICK	3	248	18	427	209
3UTEP	3	322	46	695	335
3VILAS	3	276	55	549	251
3WESTERNHI	3	25	5	50	23
3WHITE	3	59	39	70	18

PARAMETER: ARSENIC

METHOD: ATOMIC ABSORPTION
UNITS: PARTS PER MILLION

YEAR: 1972

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
31100MADEL	2	226	204	243	31
3113RITODE	3	1851	1650	1984	177
3119ACARLO	3	1142	976	1280	154
3120WILLIE	3	1224	200	1846	893
3121BRANDO	5	202	50	560	204
31409MUNDY	2	52	50	53	2
3148CHURCH	3	87	50	160	64
31730WPAIS	3	159	141	196	32
31638WPAIS	4	180	39	368	137
31844WPAIS	2	126	102	149	33
3204WILLIE	2	624	548	700	107
3216ACARLO	2	473	120	825	499
32473VFW	5	1211	293	1750	723
32510STVRA	4	183	25	550	252
32616PAISA	5	444	193	688	211
3329VISTAH	3	60	50	80	17
33407ZAPAL	1	146	146	146	
3510STVRAI	1	88	88	88	
3701TURNEY	1	161	161	161	
3706SHILLS	2	58	50	65	11
3710MCKELL	3	411	275	600	169
37107THSTR	4	69	20	150	56
3805SKANSA	1	80	80	80	
3825MUNDY	6	206	110	375	105
4ALAMO	3	99	88	110	11
4ADY	3	92	56	120	33
4BOWIE	3	111	70	150	40
4CORONADO	3	172	140	225	46
4CRISTOREY	3	407	100	580	266
4ELPASOHIG	3	240	160	320	80
4HART	3	59	32	88	28
4HOLYFAMIL	3	130	44	190	77
4JESUS&MAR	3	254	240	262	12
4LAMAR	3	142	72	263	105
4LINCOLN	3	34	26	40	7
4MESITA	3	256	59	380	173
4MOREHEAD	3	27	12	50	20
4PUTNAM	3	40	20	60	20
4ROBERTS	3	55	20	100	41

PARAMETER: ARSENIC

METHOD: ATOMIC ABSORPTION
UNITS: PARTS PER MILLION

YEAR: 1973

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
31100MADEL	2	138	123	152	21
31218RANDO	10	104	14	175	62
31409MUNDY	12	37	10	93	23
3148COURCH	12	28	3	50	15
31730WPAIS	11	69	10	230	72
31838WPAIS	12	74	13	210	71
31844WPAIS	11	34	17	60	14
32473VFW	12	1425	10	2750	779
32510STVRA	11	147	25	425	128
32616PAISA	12	226	25	550	173
3301ROBINS	8	122	25	374	114
33210PIEDM	6	100	46	300	100
3329VISTAH	11	35	10	86	22
33407ZAPAL	12	64	13	174	54
3706SHILLS	11	37	10	99	27
3708MCKELL	9	63	12	150	52
37107THSTR	11	91	14	248	90
3825MUNDY	11	115	25	341	104
4ALAMO	12	83	32	172	48
4AOY	12	136	49	220	48
4BOWIE	12	107	52	207	46
4CORONADO	12	121	20	360	90
4CRISTOREY	11	2357	260	4350	982
4ELPASOHIG	12	223	40	290	65
4HART	12	73	36	102	22
4HOLYFAMIL	12	173	80	366	89
4JESUS&MAR	12	305	112	530	122
4KERNFIRES	1	212	212	212	
4LAMAR	12	132	24	190	52
4LINCOLN	12	56	10	374	101
4MESITA	12	245	32	436	100
4MOREHEAD	11	43	8	268	75
4PUTNAM	12	36	10	145	37
4ROBERTS	11	16	4	52	14

PARAMETER: ARSENIC

METHOD: ATOMIC ABSORPTION
UNITS: PARTS PER MILLION

YEAR: 1974

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
3121BRANDO	7	73	50	100	21
31409MUNDY	12	64	15	157	42
31730WPAIS	8	64	25	120	34
31838WPAIS	11	100	46	165	41
31644WPAIS	9	64	24	131	[illegible]
32473VFW	12	1348	274	3590	1065
32510STVRA	10	169	80	252	57
32616PAISA	12	591	145	1639	503
3301ROBINS	9	142	70	191	41
3329VISTAH	10	50	19	128	37
33407ZAPAL	7	38	15	91	26
3708MCKELL	11	133	60	227	51
37107THSTR	10	111	39	178	49
3825MUNDY	10	152	63	318	72
4ALAMO	12	66	36	138	28
4ADY	12	138	80	252	53
4BOWIE	12	99	52	166	47
4BUENAVIST	12	112	40	486	119
4CORONADO	12	73	33	112	27
4CRISTOREY	12	2531	754	3560	881
4ELPASOHIG	12	267	175	418	80
4HART	11	74	28	150	35
4HOLYFAMIL	11	142	32	301	91
4JESUS&MAR	11	265	80	520	154
4LAMAR	12	129	80	186	34
4LINCOLN	12	92	12	650	181
4MESITA	12	161	94	334	72
4MOREHEAD	11	16	4	34	10
4PUTNAM	12	27	16	42	10
4ROBERTS	11	13	4	30	10

PARAMETER: ARSENIC

METHOD: ATOMIC ABSORPTION
UNITS: PARTS PER MILLION

YEAR: 1975

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
31218RANDO	1	151	151	151	
31409MUNDY	3	71	58	85	14
31730WPAIS	2	49	28	69	29
31838WPAIS	2	70	66	73	5
31844WPAIS	2	61	25	97	51
32473VFW	3	1469	633	2730	1111
32510STVRA	3	113	16	175	85
32616PAISA	3	716	556	991	239
3301ROBINS	2	163	130	195	46
3329VISTAH	1	20	20	20	
3708MCKELL	3	82	18	130	56
37107THSTR	2	95	15	175	113
3825MUNDY	1	49	49	49	
4ALAMO	3	41	8	74	33
4AOY	3	89	10	200	99
4BOWIE	2	107	75	138	45
4BUENAVIST	3	40	27	50	12
4CORONADO	2	55	8	101	66
4CRISTOREY	3	1930	1150	3140	1062
4ELPASOHIG	3	263	8	420	223
4HART	2	145	8	282	194
4HOLYFAMIL	2	106	54	158	74
4JESUS&MAR	3	263	8	480	238
4LAMAR	3	116	8	194	97
4LINCOLN	1	20	20	20	
4MESITA	3	137	130	146	8
4MOREHEAD	1	16	16	16	
4PUTNAM	3	30	28	32	2
4ROBERTS	1	8	8	8	

PARAMETER: ARSENIC

METHOD: ATOMIC ABSORPTION
UNITS: PARTS PER MILLION

YEAR: 1972

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
4ROOSEVELT	3	239	130	346	108
4SACREDHEA	3	350	180	620	236
4SANJACINT	2	104	63	144	57
4STCLEMENT	3	150	124	176	26
4STIGNATIO	3	44	32	55	12
4STMICHAEL	2	445	440	450	7
4STPATRICK	3	279	160	440	145
4UTEP	3	243	220	270	25
4VILAS	3	183	130	240	55
4WESTERNHI	3	110	50	160	56
4WHITE	3	82	75	90	8
41100MADEL	3	256	200	360	90
4113RITODE	1	260	260	260	
4119ACARLO	1	70	70	70	
4120WILLIE	1	970	970	970	
41218RANDO	3	103	68	120	30
41409MUNDY	3	109	56	150	48
4148CHURCH	3	41	40	44	2
41730WPAIS	3	101	88	114	13
41838WPAIS	3	165	120	200	41
41844WPAIS	3	106	52	142	47
42473VFW	3	2367	2160	2570	205
42510STVRA	3	1140	300	2680	1336
42616PAISA	3	402	65	660	305
43210PIEDM	1	120	120	120	
4329VISTAH	3	38	28	50	11
43407ZAPAL	2	58	55	60	4
4701TURNEY	1	140	140	140	
4706SHILLS	3	810	65	2200	1205
4710MCKELL	1	1680	1680	1680	
47107THSTR	3	147	96	180	45
4805SKANSA	1	50	50	50	
4825MUNDY	2	266	230	302	51

PARAMETER: ARSENIC

METHOD: ATOMIC ABSORPTION
UNITS: PARTS PER MILLION

YEAR: 1973

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
4ROOSEVELT	12	176	116	240	46
4SACREDHEA	12	207	112	340	67
4SANJACINT	12	107	12	181	53
4STCLEMENT	10	189	88	638	160
4STIGNATIO	12	82	26	134	37
4STMICHAEL	12	218	64	430	139
4STPATRICK	12	224	105	420	80
4UTEP	12	245	86	360	87
4VILAS	10	253	140	366	74
4WESTERNHI	11	47	12	160	41
4WHITE	11	226	40	1360	378
41100MADEL	2	173	85	260	124
4121GRANDO	10	271	160	544	124
41409MUNDY	12	110	36	165	35
4148CHURCH	12	52	11	96	28
41730WPAIS	12	133	64	260	71
41838WPAIS	12	146	33	306	73
41844WPAIS	12	104	0	226	54
42473VFW	11	2616	1285	4500	1052
42510STVEA	12	291	160	450	98
42616PAISA	12	655	253	1450	349
4301ROBINS	8	319	122	680	192
43210PIEDM	7	78	51	104	18
4329VISTAH	12	70	6	168	50
43407ZAPAL	11	32	0	80	23
4706SHILLS	11	60	16	105	25
4708MCKELL	9	296	186	545	150
47107THSTR	12	161	96	225	41
4825MUNDY	11	233	114	332	74

PARAMETER: ARSENIC

METHOD: ATOMIC ABSORPTION
UNITS: PARTS PER MILLION

YEAR: 1974

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
4ROOSEVELT	11	137	25	229	70
4SACREDHEA	12	243	88	370	38
4SANJACINT	11	117	44	240	63
4STCLEMENT	12	174	80	230	45
4STIGNATIO	7	91	54	200	51
4STMICHAEL	6	127	104	157	21
4STPATRICK	12	262	150	342	67
4UTEP	10	193	114	302	61
4VILAS	12	270	126	470	100
4WESTERNHI	11	33	16	54	15
4WHITE	11	103	22	213	57
41215RANIC	7	116	72	192	40
41409MUNDY	12	110	60	231	51
41730WPAIS	8	94	60	160	40
41838WPAIS	11	163	52	239	74
41844WPAIS	9	127	67	373	44
42473VFW	12	2305	1320	3475	693
42510STVRA	12	253	93	384	95
42616PAISA	12	940	337	2250	536
4301ROBINS	10	201	120	342	69
4329VISTAH	9	52	10	101	[illegible]
43407ZAPAL	7	43	11	101	30
4708MCKELL	12	163	26	240	54
47107THSTE	10	144	82	205	37
4825MUNDY	10	136	125	310	62

PARAMETER: ARSENIC

METHOD: ATOMIC ABSORPTION
UNITS: PARTS PER MILLION

YEAR: 1975

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
4ROOSEVELT	1	254	254	254	
4SACREDHEA	3	211	12	360	179
4SANJACINT	2	154	108	200	65
4STCLEMENT	3	111	24	200	88
4STPATRICK	3	240	8	380	202
4UTEP	2	122	26	217	135
4VILAS	3	255	50	454	202
4WESTERNHI	1	36	36	36	
4WHITE	3	66	46	80	18
41218RANDO	1	85	85	85	
41409MUNDY	3	64	44	76	17
41730WPAIS	1	12	12	12	
41838WPAIS	2	91	47	135	62
41844WPAIS	2	163	125	200	53
42473VFW	3	1511	773	2700	1040
42510STVRA	3	131	8	196	107
42616PAISA	3	906	530	1188	339
4301ROBINS	3	145	100	206	55
4329VISTAH	1	9	9	9	
4708MCKELL	3	124	12	250	120
47107THSTR	2	45	30	60	21

PARAMETER: CADMIUM

METHOD: ATOMIC ABSORPTION
UNITS: PARTS PER MILLION

YEAR: 1975

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
1ALAMO	3	6	3	10	4
1AOY	3	5	3	10	4
1BOWIE	3	7	3	10	4
1BUENAVIST	3	3	3	3	0
1CORONADO	3	7	3	15	7
1CRISTOREY	3	305	195	410	108
1ELPASOHIG	3	22	10	45	20
1HART	3	6	3	10	4
1HOLYFAMIL	3	12	10	15	3
1JESUS&MAR	3	18	15	20	3
1LAMAR	3	27	3	75	42
1LINCOLN	3	7	3	15	7
1MESITA	3	4	3	5	1
1MOREHEAD	3	3	3	3	0
1PUTNAM	3	82	3	240	137
1ROBERTS	3	3	3	3	0
1ROOSEVELT	2	3	3	3	0
1SACREDHEA	3	14	3	20	9
1SANJACINT	3	8	3	10	4
1STCLEMENT	3	5	3	8	3
1STPATRICK	3	9	5	12	4
1UTEP	3	10	3	15	6
1VILAS	3	13	3	30	15
1WESTERNHI	3	33	3	92	51
1WHITE	3	4	3	5	1
11218RANDO	2	33	25	40	11
11409MUNDY	3	11	10	12	1
11730WPAIS	3	6	3	10	4
11638WPAIS	3	5	3	8	3
11844WPAIS	3	9	3	15	6
12473VFW	3	207	135	280	73
12510STVRA	3	9	5	10	3
12616PAISA	3	203	178	240	33
1301ROBINS	3	6	3	10	4

PARAMETER: CADMIUM

METHOD: ATOMIC ABSORPTION
UNITS: PARTS PER MILLION

YEAR: 1974

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
1ALAMO	12	4	2	10	2
1ACY	12	6	3	11	2
1BOWIE	12	7	3	[illegible]	3
1BUENAVIST	12	23	2	235	67
1CORONADO	12	4	2	7	2
1CHRISTOREY	12	153	10	385	107
1ELPASOHIG	12	17	5	40	9
1HART	12	5	2	10	3
1HOLYFAMIL	12	13	6	19	4
1JESUS&MAR	12	19	10	40	7
1LAMAR	12	6	3	10	3
1LINCOLN	12	4	2	10	2
1MESITA	12	7	3	16	4
1MOREHEAD	12	5	3	15	3
1PUTNAM	12	5	2	15	3
1ROBERTS	12	4	2	10	2
1ROOSEVELT	12	6	3	15	4
1SACREDHEA	12	18	7	30	6
1SANJACINT	12	5	3	12	3
1STCLEMENT	12	6	3	11	3
1STIGNATIO	8	19	14	25	4
1STMICHAEL	7	3	2	5	1
1STPATRICK	12	9	3	16	5
1UTEP	12	14	10	21	4
1VILAS	12	8	2	20	6
1WESTERNHI	12	4	2	12	3
1WHITE	12	5	2	10	2
1121BRANDO	12	27	4	64	22
11409MUNDY	12	15	5	35	7
11730WPAIS	12	5	2	15	4
11838WPAIS	12	15	2	112	31
11844WPAIS	12	13	9	20	4
12473VFW	11	127	9	235	75
12510STVRA	12	10	3	20	5
12616PAISA	12	156	30	300	77
1301ROBINS	12	11	7	15	4

PARAMETER: CADMIUM

METHOD: ATOMIC ABSORPTION
UNITS: PARTS PER MILLION

YEAR: 1973

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
1ALAMO	12	9	2	10	2
1ADY	12	11	5	20	4
1BOWIE	12	10	5	20	4
1CORONADO	12	9	2	10	3
1CHRISTOREY	12	213	106	525	109
1ELPASOHIG	12	13	4	20	5
1HART	12	10	5	15	2
1HOLYFAMIL	11	13	10	25	4
1JESUSSMAR	12	18	10	25	6
1KENNFIRES	1	15	15	15	
1LAMAR	12	10	3	15	3
1LINCOLN	12	9	1	10	3
1MESITA	12	9	4	10	2
1MOREHEAD	12	9	2	15	4
1PUTNAM	12	9	2	10	3
1ROBERTS	12	11	1	40	10
1ROOSEVELT	12	10	7	15	2
1SACREDHEA	12	34	20	160	40
1SANJACINT	12	10	5	20	4
1STCLEMENT	12	23	10	100	25
1STIGNATIO	12	23	15	30	5
1STMICHAEL	12	9	2	10	[illegible]
1STPATRICK	12	15	9	25	6
1UTEP	12	16	10	20	4
1VILAS	12	11	1	20	5
1WESTERNHI	12	9	1	10	3
1WHITE	12	10	2	15	4
11100MADEL	2	10	10	10	0
11218RANDO	12	12	2	25	7
11409MUNDY	12	19	10	25	5
1148CHURCH	12	13	5	25	5
11730WPAIS	12	12	3	20	4
11658WPAIS	12	13	7	20	4
11E44WPAIS	12	17	5	25	5
12475VFW	12	105	35	165	37
12510STVRA	12	14	10	20	4
12616PAISA	12	181	25	315	71
1301ROBINS	9	16	10	20	4
13210BRIEN	12	13	5	30	[illegible]

PARAMETER: CADMIUM

METHOD: ATOMIC ABSORPTION
UNITS: PARTS PER MILLION

YEAR: 1972

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
1ALAMO	2	10	10	10	0
1ADY	3	10	10	10	0
1BOWIE	3	8	5	10	3
1CORONADO	4	21	5	60	26
1CRISTOREY	7	139	40	320	110
1ELPASOHIG	4	12	7	20	6
1HART	3	8	5	10	3
1HOLYFAMIL	4	20	10	30	8
1JESUS&MAR	4	18	10	20	5
1LAMAR	3	122	5	350	198
1LINCOLN	2	10	10	10	0
1MESITA	4	16	5	40	16
1MOREHEAD	2	10	10	10	0
1PUTNAM	2	10	10	10	0
1ROBERTS	2	10	10	10	0
1ROOSEVELT	2	10	10	10	0
1SACREDHEA	5	26	20	40	8
1SANJACINT	4	11	5	20	6
1STCLEMENT	4	21	10	40	13
1STIGNATIO	5	23	15	40	10
1STMICHAEL	2	10	10	10	0
1STPATRICK	3	12	10	15	3
1UTEP	3	11	7	15	4
1VILAS	3	217	10	630	358
1WESTERNHI	2	10	10	10	0
1WHITE	2	10	10	10	0
1110WILLIE	2	80	60	100	28
11100MADEL	5	13	10	20	4
1113RITODE	5	110	100	120	10
1119ACARLO	5	49	30	65	17
1120WILLIE	5	60	40	80	16
11218RANDO	7	29	15	60	16
11409MUNDY	5	16	10	20	4
1148COURCH	5	17	5	40	14
11730WPAIS	4	11	5	20	6
11838WPAIS	4	11	5	20	6
11844WPAIS	7	21	10	40	13
1200CARLOS	1	40	40	40	
1204WILLIE	4	75	50	100	21
1216ACARLO	4	50	30	80	22
12473VFW	7	67	10	150	48
12510STVRA	3	12	10	15	3
12616PAISA	7	150	100	260	59
13210PIEDM	3	12	5	20	8

PARAMETER: CADMIUM

METHOD: ATOMIC ABSORPTION
UNITS: PARTS PER MILLION

YEAR: 1972

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
1324VISTAH	5	17	5	40	14
13407ZAPAL	4	23	10	60	25
1425MUNDY	2	15	10	20	7
1701TURNEY	3	10	5	15	5
1705SHILLS	3	30	10	40	17
1710MCKELL	5	26	5	80	31
17107THSTR	2	25	10	40	21
1805SKANSA	1	10	10	10	
1825MUNDY	4	13	10	40	15
2ALAMO	7	6	2	13	4
2ADY	7	8	5	12	3
2BOWIE	7	8	6	10	1
2CORONADO	7	2	1	6	2
2CRISTOREY	7	171	57	460	157
2ELPASOHIG	7	7	3	12	3
2FRANKLIN	4	4	3	5	1
2HART	7	5	2	11	3
2HOLYFAMIL	6	18	13	26	5
2JESUS&MAR	6	14	11	17	2
2LAMAR	7	4	1	11	3
2LINCOLN	6	1	1	3	1
2MESITA	7	7	4	11	3
2MOREHEAD	7	2	1	5	1
2PUTNAM	7	3	1	7	2
2ROBERTS	7	2	1	4	1
2ROOSEVELT	7	7	5	9	2
2SACREDHEA	6	22	19	26	3
2SANJACINT	7	6	3	11	3
2STCLEMENT	6	16	12	19	2
2STIGNATIO	6	18	12	24	5
2STMICHAEL	6	2	1	3	1
2STPATRICK	6	10	5	15	4
2UTEP	6	11	6	14	3
2VILAS	7	9	4	16	4
2WESTERNHI	7	3	1	5	2
2WHITE	6	4	2	6	2
2100MADELI	1	12	12	12	
2110WILLIS	2	88	58	118	42
21100MADEL	6	10	6	16	4
2113RITTOE	5	136	114	146	14
2119ACARLO	5	39	3	74	26
2120WILLIE	5	58	36	100	26
21218RANDO	7	22	17	27	3
21409MUNDY	7	15	14	18	2
2148CHURCH	7	7	4	12	3
21730WPAIS	7	6	1	9	3
21833WPAIS	7	10	5	26	7

PARAMETER: CADMIUM

METHOD: ATOMIC ABSORPTION
UNITS: PARTS PER MILLION

YEAR: 1973

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
1329VISTAH	12	11	7	15	2
13407ZAPAL	12	9	4	10	2
1701TURNEY	1	10	10	10	
1706SHILLS	11	10	5	15	2
1708MCKELL	9	10	5	15	3
17107THSTR	12	10	5	15	2
1825MUNDY	12	10	2	25	6
2ALAMO	12	6	3	9	2
2ADY	11	8	4	22	5
2BOWIE	12	7	1	11	3
2CORONADO	12	4	1	6	2
2CRISTOREY	12	179	90	284	59
2ELPASOHIG	12	10	4	16	4
2HART	12	5	2	9	2
2HOLYFAMIL	12	14	7	20	4
2JESUS&MAR	12	15	8	20	4
2KERNFIRES	1	11	11	11	
2LAMAR	12	7	3	13	3
2LINCOLN	12	2	1	4	1
2MESITA	12	4	1	9	2
2MOREHEAD	12	2	1	5	1
2PUTNAM	12	4	1	7	2
2ROBERTS	12	2	1	4	1
2ROOSEVELT	12	8	3	15	4
2SACREDHEA	12	33	9	173	44
2SANJACINT	12	6	1	10	3
2STCLEMENT	12	12	3	17	5
2STIGNATIO	12	21	11	32	6
2STMICHAEL	12	2	1	4	1
2STPATRICK	12	12	3	19	4
2UTEP	12	13	3	20	5
2VILAS	12	8	3	14	3
2WESTERNHI	12	3	1	7	2
2WHITE	12	5	1	9	2
21100MADEL	2	9	7	11	3
21218RANDO	12	9	1	21	7
21409MUNDY	12	13	6	20	4
2148CDURCH	12	7	3	11	3
21730WPAIS	12	6	3	10	2
21838WPAIS	12	8	2	18	4

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                  PARAMETER: CADMIUM

                     METHOD: ATOMIC ABSORPTION
                      UNITS: MICROGRAMS/CUBIC METER

                       YEAR: 1973

               NUMBER OF                                              STANDARD
    SITE         SAMPLES    AVERAGE     MINIMUM     MAXIMUM DEVIATION

  1HOLYFAMIL          1          25          25          25
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PARAMETER: CADMIUM

METHOD: ATOMIC ABSORPTION
UNITS: PARTS PER MILLION

YEAR: 1974

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
1329VISTAH	11	22	3	170	49
13407ZAPAL	11	4	2	6	1
1708MCKELL	12	13	8	20	4
17107THSTR	12	5	2	10	2
1825MUNDY	10	6	2	10	3
2ALAMO	12	6	2	9	2
2AOY	12	6	1	10	3
2BOWIE	12	7	4	12	2
2BUENAVIST	12	24	2	252	72
2CORONADO	12	4	1	8	2
2CRISTOREY	12	208	4	792	209
2ELPASOHIG	12	13	1	27	7
2HART	11	6	3	10	2
2HOLYFAMIL	12	15	1	38	9
2JESUS&MAR	12	16	7	25	6
2LAMAR	12	5	1	9	2
2LINCOLN	12	3	1	6	2
2MESITA	12	5	1	8	3
2MOREHEAD	11	3	1	10	3
2PUTNAM	12	5	1	14	3
2ROBERTS	12	3	1	7	2
2ROOSEVELT	12	5	1	11	3
2SACREDHEA	12	18	10	28	5
2SANJACINT	12	7	3	10	2
2STCLEMENT	12	5	1	12	4
2STIGNATIO	8	18	13	24	4
2STMICHAEL	7	2	1	3	1
2STPATRICK	12	10	1	17	4
2UTEP	12	15	7	22	5
2VILAS	12	7	1	12	4
2WESTERNHI	12	4	1	8	2
2WHITE	12	4	1	10	3
21218RANDO	12	24	1	62	22
21409MUNDY	12	14	7	22	4
21730WPAIS	12	5	1	9	2
21838WPAIS	12	16	1	129	36

PARAMETER: CADMIUM

METHOD: ATOMIC ABSORPTION
UNITS: PARTS PER MILLION

YEAR: 1975

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
1329VISTAH	1	3	3	3	
1708MCKELL	3	6	3	10	4
17107THSTR	3	6	3	10	4
1825MUNDY	1	10	10	10	
2ALAMO	3	6	3	10	4
2AOY	3	7	4	13	5
2BOWIE	3	6	4	10	3
2BUENAVIST	3	2	1	5	2
2CORONADO	3	7	1	12	6
2CHRISTOREY	3	291	226	354	64
2ELPASOHIG	3	22	6	47	22
2HART	3	5	1	12	6
2HOLYFAMIL	3	14	9	17	4
2JESUS&MAR	3	19	16	23	4
2LAMAR	3	6	3	11	4
2LINCOLN	3	4	1	6	3
2MESITA	3	6	1	9	4
2MOREHEAD	3	4	1	6	3
2PUTNAM	3	7	1	11	5
2ROBERTS	3	5	1	8	4
2ROOSEVELT	2	3	1	5	3
2SACREDHEA	3	12	2	20	9
2SANJACINT	3	8	5	13	4
2STCLEMENT	3	3	2	4	1
2STPATRICK	3	8	5	12	4
2UTEP	3	11	1	19	9
2VILAS	3	11	4	20	8
2WESTERNHI	3	4	1	7	3
2WHITE	3	7	5	11	3
21216RANDO	2	31	20	42	16
21409MUNDY	3	11	7	16	5
21730WPAIS	3	5	2	8	3
21838WPAIS	3	4	1	9	4

PARAMETER: CADMIUM

METHOD: ATOMIC ABSORPTION
UNITS: PARTS PER MILLION

YEAR: 1972

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
21844WPAIS	7	13	10	16	2
2200CARLOS	1	40	40	40	
2204WILLIE	4	81	72	92	8
2216ACARLO	4	51	26	66	17
22473VFW	7	71	18	172	50
22510STVRA	6	5	2	13	4
22616PAISA	7	165	114	264	64
2305SKANSA	1	13	13	13	
23210PIEDM	6	5	2	8	2
2329VISTAH	7	8	6	10	1
23407ZAPAL	7	4	1	7	2
2425MUNDY	2	8	8	8	0
2510STVRAI	1	2	2	2	
2701TURNEY	7	3	1	9	3
2706SHILLS	7	5	2	9	2
2710MCKELL	6	7	4	10	2
27107THSTR	7	4	1	6	2
2805SKANSA	4	9	6	10	2
2825MUNDY	5	23	10	68	25
3ALAMO	5	155	37	559	226
3AOY	7	76	50	156	38
3BOWIE	7	54	15	100	27
3CORONADO	6	108	79	140	21
3CRISTOREY	7	291	160	550	129
3ELPASOHIG	7	71	50	100	16
3FRANKLIN	3	327	202	400	109
3HART	5	45	25	60	13
3HOLYFAMIL	5	75	50	100	24
3JESUS&MAR	6	100	30	140	41
3LAMAR	6	48	10	120	40
3LINCOLN	5	246	10	980	413
3MESITA	7	202	84	380	117
3MOREHEAD	3	53	50	60	6
3PUTNAM	4	33	10	50	21
3ROBERTS	5	43	10	83	29
3ROOSEVELT	7	144	71	225	51
3SACREDHEA	6	110	69	150	29
3SANJACINT	6	97	20	300	105
3STCLEMENT	6	59	20	100	31
3STIGNATIO	3	90	30	133	54
3STMICHAEL	4	90	60	138	37
3STPATRICK	6	90	50	150	36
3UTEP	6	74	30	125	35
3VILAS	7	257	80	1000	329
3WESTERNHI	7	103	30	179	64
3WHITE	6	88	60	134	26

PARAMETER: CADMIUM

METHOD: ATOMIC ABSORPTION
UNITS: PARTS PER MILLION

YEAR: 1973

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
21844WPAIS	12	12	6	20	4
22473VEW	12	133	35	425	101
22510STVRA	12	9	4	17	4
22616PAISA	12	199	26	340	77
2301ROBINS	9	12	3	23	6
23210PIEDM	12	11	5	36	10
2329VISTAH	12	9	3	13	3
23407ZAPAL	12	5	2	15	3
2701TURNEY	1	6	6	6	
2706SHILLS	11	6	3	11	2
2708MCKELL	9	5	1	9	3
27107THSTP	12	6	2	9	2
2825MUNDY	12	6	1	16	5
3ALAMO	12	63	50	100	21
3ADY	12	101	31	306	73
3BOWIE	12	68	50	112	24
3CORONADO	11	85	50	173	35
3CRISTOREY	11	1256	888	1639	248
3ELPASOHIG	12	123	50	234	45
3HART	12	56	40	100	16
3HOLYFAMIL	12	114	50	346	85
3JESUS&MAR	12	129	50	222	45
3KERNFIRES	1	100	100	100	
3LAMAR	12	78	50	115	24
3LINCOLN	12	80	10	336	85
3MESITA	12	154	71	250	55
3MOREHEAD	12	50	20	75	12
3PUTNAM	12	48	25	75	13
3ROBERTS	12	47	10	75	16
3ROOSEVELT	12	119	50	358	86
3SACREDHEA	12	118	75	216	45
3SANJACINT	11	139	50	373	124
3STCLEMENT	10	233	50	1158	345
3STIGNATIO	12	63	25	128	29
3STMICHAEL	12	106	50	277	61
3STPATRICK	11	129	75	225	50
3UTEP	12	130	59	287	57
3VILAS	11	310	138	1100	274
3WESTERNHI	11	100	50	148	29
3WHITE	12	120	50	240	62

PARAMETER: CADMIUM

METHOD: ATOMIC ABSORPTION
UNITS: PARTS PER MILLION

YEAR: 1974

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
21844WPAIS	12	11	2	16	4
22473VFW	11	134	12	290	90
22510STVRA	12	9	2	17	4
22616PAISA	12	187	32	550	132
2301ROBINS	12	22	4	151	41
2329VISTAH	11	9	5	14	2
23407ZAPAL	11	4	1	8	2
2708MCKELL	12	11	5	18	3
27107THSTR	12	5	1	9	2
2825MUNDY	10	6	1	9	3
3ALAMO	12	35	20	65	14
3AOY	12	96	13	255	64
3BOWIE	12	56	25	181	44
3BUENAVIST	12	31	23	50	9
3CORONADO	12	68	25	148	34
3CRISTOREY	11	1123	280	1694	447
3ELPASOHIG	12	103	36	265	60
3HART	11	40	15	75	20
3HOLYFAMIL	11	57	25	100	25
3JESUS&MAR	11	153	80	284	67
3LAMAR	12	77	25	300	75
3LINCOLN	12	52	15	164	44
3MESITA	12	87	25	200	50
3MOREHEAD	12	22	10	45	9
3PUTNAM	12	25	10	50	14
3ROBERTS	12	20	10	25	6
3ROOSEVELT	11	66	35	96	20
3SACREDHEA	12	121	40	235	70
3SANJACINT	9	78	44	163	41
3STCLEMENT	12	65	25	225	54
3STIGNATIO	7	40	25	104	29
3STMICHAEL	6	74	25	186	59
3STPATRICK	12	89	25	150	33
3UTEP	10	112	82	175	27
3VILAS	12	185	83	392	90
3WESTERNHI	11	62	10	141	45
3WHITE	11	119	25	504	136

PARAMETER: CADMIUM

METHOD: ATOMIC ABSORPTION
UNITS: PARTS PER MILLION

YEAR: 1975

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
21844WPAIS	3	8	5	12	4
22473VFW	3	214	119	300	91
22510STVRA	3	6	4	10	3
22616PAISA	3	214	165	254	45
2301ROBINS	3	7	4	12	4
2329VISTAH	1	1	1	1	
2708MCKELL	3	5	1	9	4
27107THSTR	3	7	2	12	5
2825MUNDY	1	7	7	7	
3ALAMO	3	77	15	140	63
3ADY	3	58	15	110	48
3BOWIE	3	48	15	72	30
3BUENAVIST	3	36	25	58	19
3CORONADO	3	45	3	106	54
3CRISTOREY	3	959	496	1655	614
3ELPASOHIG	3	111	17	175	83
3HART	3	74	15	182	94
3HOLYFAMIL	3	30	15	50	18
3JESUS&MAR	3	135	15	201	104
3LAMAR	3	37	5	90	46
3LINCOLN	3	40	3	101	53
3MESITA	3	99	50	153	52
3MOREHEAD	3	18	15	25	6
3PUTNAM	3	12	5	15	6
3ROBERTS	3	15	15	15	0
3ROOSEVELT	2	104	83	125	30
3SACREDHEA	3	133	15	225	108
3SANJACINT	2	38	15	60	32
3STCLEMENT	3	55	15	100	43
3STPATRICK	3	66	15	100	45
3UTEP	3	84	46	131	43
3VILAS	3	206	15	377	182
3WESTERNHI	3	18	3	25	13
3WHITE	3	51	42	57	8

PARAMETER: CADMIUM

METHOD: ATOMIC ABSORPTION
UNITS: PARTS PER MILLION

YEAR: 1972

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
3110WILLIF	1	510	510	510	
31100MADEL	4	150	62	249	91
3113RITOPE	5	1517	944	1771	337
3119ACARLO	6	1625	1160	2213	416
3120WILLIE	5	980	160	1619	568
31218RANDO	7	103	40	160	45
31409MUNDY	6	42	25	56	13
3148CHURCH	6	90	20	360	133
31730WPAIS	6	97	28	145	51
31838WFAIS	7	99	41	161	53
31844WPAIS	5	79	60	109	19
3200CARLOS	1	330	330	330	
3204WILLIE	4	710	640	800	68
3216ACARLO	4	530	220	685	218
32473VFW	7	1100	440	1925	529
32510STVRA	6	122	50	200	73
32616PAISA	7	583	438	760	118
33210PIEDM	3	79	47	120	37
3329VISTAH	5	36	20	50	15
33407ZAPAL	5	236	40	963	410
3425MUNDY	2	45	40	50	7
3510STVRAI	1	80	80	80	
3701TURNEY	4	106	30	145	52
3706SHILLS	5	38	20	50	16
3710MCKELL	5	231	188	350	67
37107THSTR	7	307	60	860	307
3805SKANSA	3	27	20	40	12
3825MUNDY	5	80	40	120	34
4ALAMO	7	61	35	80	15
4ADY	7	68	25	122	35
4BOWIE	7	45	16	76	26
4CORONADO	7	107	70	149	32
4CRISTOREY	7	362	35	675	207
4ELPASOHIG	7	77	9	110	32
4FRANKLIN	3	398	243	520	141
4HART	7	38	15	70	20
4HOLYFAMIL	6	77	35	126	34
4JESUS&MAR	6	151	65	260	66
4LAMAR	7	38	3	58	20
4LINCOLN	7	28	5	110	39
4MESITA	7	167	19	360	128
4MOREHEAD	7	43	5	250	92
4PUTNAM	7	28	5	110	39
4ROBERTS		23			

PARAMETER: CADMIUM

METHOD: ATOMIC ABSORPTION
UNITS: PARTS PER MILLION

YEAR: 1973

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
31100MADEL	2	157	123	190	47
31213FANDU	10	123	50	227	51
31409MUNDY	12	52	30	93	14
3148COURCH	12	46	3	75	17
31730WPAIS	11	68	25	175	42
31638WPAIS	12	104	50	210	47
31644WPAIS	11	83	41	171	47
32473VFW	12	1296	550	2100	597
32510STVFA	11	137	100	200	29
32616PAISA	12	409	179	725	164
3301ROBINS	8	153	50	400	149
33210PIEDM	6	60	17	100	31
3329VISTAH	11	52	17	129	28
33407ZAPAL	12	74	34	174	43
3706SHILLS	11	124	46	685	191
3708MCKELL	9	95	50	150	37
37107THSTF	11	333	75	2000	561
3825MUNDY	11	109	50	341	83
4ALAMO	12	28	5	85	25
4ADY	12	69	15	145	42
4BOWIE	12	47	23	80	22
4CORONADO	12	82	7	290	82
4CRISTOREY	11	1325	146	1614	486
4ELPASOHIG	12	93	25	125	33
4HART	12	37	5	125	33
4HOLYFAMIL	12	39	14	70	19
4JESUS&MAR	12	109	13	175	53
4KERNFIRES	1	90	90	90	
4LAMAR	12	48	14	80	19
4LINCOLN	12	25	5	134	36
4MESITA	12	139	36	222	61
4MOREHEAD	12	18	7	50	13
4PUTNAM	11	17	5	45	12
4ROBERTS	11	16	5	35	10

PARAMETER: CADMIUM

METHOD: ATOMIC ABSORPTION
UNITS: PARTS PER MILLION

YEAR: 1974

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
31218RANDO	7	88	43	124	30
31409MUNDY	12	40	25	84	18
31730WPAIS	8	54	25	111	36
31638WPAIS	11	81	23	150	49
31844WPAIS	9	78	30	185	54
32473VFW	12	994	12	1710	439
32510STVRA	10	118	46	194	40
32616PAISA	12	404	190	832	222
3301ROBINS	9	91	50	157	38
3329VISTAH	10	50	6	170	49
33407ZAPAL	7	45	13	152	49
3708MCKELL	11	120	53	521	134
37107THSTR	10	109	73	132	32
3825MUNDY	10	99	66	145	28
4ALAMO	11	32	7	58	18
4ADY	12	75	19	145	37
4BOWIE	12	37	8	83	23
4BUENAVIST	12	39	9	80	27
4CORONADO	12	50	14	79	20
4CRISTOREY	12	1254	311	1875	429
4ELPASOHIG	12	149	5	675	172
4HART	11	29	10	53	13
4HOLYFAMIL	11	45	11	95	23
4JESUS&MAR	11	123	32	220	69
4LAMAR	12	78	27	366	94
4LINCOLN	12	23	1	115	31
4MESITA	12	79	17	178	47
4MOREHEAD	11	10	5	18	5
4PUTNAM	11	20	5	52	15
4ROBERTS	11	8	5	19	5

PARAMETER: CADMIUM

METHOD: ATOMIC ABSORPTION
UNITS: PARTS PER MILLION

YEAR: 1975

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
31218RANDO	1	38	38	38	
31409MUNDY	3	22	15	25	6
31730WPAIS	2	42	15	69	38
31838WPAIS	2	61	56	66	7
31844WPAIS	2	42	25	58	23
32473VFW	3	878	93	1890	920
32510STVRA	3	293	16	750	399
32616PAISA	3	380	300	482	93
3301ROBINS	2	70	50	90	28
3329VISTAH	1	20	20	20	
3708MCKELL	3	58	15	109	47
37107THSTR	2	84	15	152	97
3825MUNDY	1	24	24	24	
4ALAMO	3	70	17	147	68
4ADY	3	65	6	112	54
4BOWIE	3	47	11	87	38
4BUENAVIST	3	21	5	31	14
4CORONADO	3	73	12	161	78
4CRISTOREY	3	875	520	1550	585
4ELPASOHIG	3	124	20	180	90
4HART	3	84	11	190	94
4HOLYFAMIL	3	40	9	60	27
4JESUS&MAR	3	191	36	326	146
4LAMAR	3	77	6	118	62
4LINCOLN	3	20	8	30	11
4MESITA	3	152	81	272	105
4MOREHEAD	3	16	8	23	8
4PUTNAM	3	83	10	223	121
4ROBERTS	2	28	5	50	32

PARAMETER: CADMIUM

METHOD: ATOMIC ABSORPTION
UNITS: PARTS PER MILLION

YEAR: 1972

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
4ROOSEVELT	7	206	133	360	82
4SACREDHEA	6	211	135	338	90
4SANJACINT	6	52	30	110	29
4STCLEMENT	6	71	28	139	44
4STIGNATIO	6	30	16	42	11
4STMICHAEL	5	89	57	139	34
4STPATRICK	6	105	42	255	76
4UTEP	6	100	61	185	46
4VILAS	7	240	105	675	194
4WESTERNHI	7	151	39	290	88
4WHITE	6	145	8	390	136
4100MADELI	1	10	10	10	
4110WILLIE	1	610	610	610	
41100MADEL	6	50	5	100	41
4113PITODE	5	1465	190	2115	810
4119ACARLO	4	1898	1706	2000	131
4120WILLIE	5	1273	1005	1760	312
41218FANDO	7	66	14	180	62
41409MUNDY	7	46	10	110	31
4148CHURCH	7	14	5	27	8
41730WPAIS	7	47	10	102	35
41838WPAIS	7	60	2	121	45
41844WPAIS	7	91	44	180	49
4200CARLOS	1	400	400	400	
4204WILLIE	4	841	630	1150	221
4216ACARLO	4	594	475	690	89
42473VFW	7	1425	850	1995	410
42510STVRA	6	199	49	550	187
42616PAISA	7	1545	390	6700	2283
4305SKANSA	1	5	5	5	
43210PIEDM	5	89	30	130	41
4329VISTAH	7	11	5	24	6
43407ZAPAL	6	17	5	33	10
4425MUNDY	2	77	50	103	37
4510STVRAI	1	88	88	88	
4701TURNEY	3	28	10	45	18
4706SHILLS	7	25	5	52	16
4710MCKELL	5	255	180	320	61
47107THSTR	7	229	40	670	212
4805SKANSA	4	21	5	52	22
4825MUNDY	4	81	55	110	25

PARAMETER: CADMIUM

METHOD: ATOMIC ABSORPTION
UNITS: PARTS PER MILLION

YEAR: 1973

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
4ROOSEVELT	12	100	14	210	56
4SACREDHEA	12	90	5	135	42
4SANJACINT	12	64	10	150	45
4STCLEMENT	10	173	11	1216	367
4STIGNATIO	12	20	5	50	15
4STMICHAEL	12	66	11	140	40
4STPATRICK	12	121	10	220	65
4UTEP	12	101	41	175	36
4VILAS	11	273	65	950	246
4WESTERNHI	12	57	10	180	45
4WHITE	12	94	5	162	39
41100MADEL	2	176	171	180	6
41218RANDO	10	113	16	200	67
41409MUNDY	12	27	3	65	19
4148CHURCH	12	16	3	35	9
41730WPAIS	12	38	7	70	18
41838WPAIS	12	60	8	117	34
41844WPAIS	12	42	5	125	33
42473VFW	12	1280	190	2180	644
42510STVRA	12	164	9	700	180
42616PAISA	12	387	30	870	226
4301ROBINS	8	83	16	200	59
43210PIEDM	7	50	12	110	34
4329VISTAH	12	21	5	50	13
43407ZAPAL	11	20	1	75	21
4706SHILLS	11	47	25	90	21
4708MCKELL	9	109	12	205	74
47107THSTR	12	279	16	2325	645
4825MUNDY	11	63	14	114	36

PARAMETER: CADMIUM

METHOD: ATOMIC ABSORPTION
UNITS: PARTS PER MILLION

YEAR: 1974

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
4ROOSEVELT	11	61	16	150	35
4SACREDHEA	12	121	61	270	65
4SANJACINT	11	61	16	165	45
4STCLEMENT	12	56	27	160	38
4STIGNATIO	7	30	11	65	17
4STMICHAEL	6	55	41	72	12
4STPATRICK	12	84	33	140	31
4UTEP	10	93	25	129	29
4VILAS	12	183	80	411	100
4WESTERNHI	11	52	6	156	47
4WHITE	11	336	14	2500	726
4121BRANDO	7	94	37	266	79
41409MUNDY	12	48	17	165	46
41730WPAIS	8	42	20	69	15
41638WPAIS	11	96	20	333	90
41844WPAIS	9	48	16	151	33
42473VFW	12	1250	457	2100	491
42510STVRA	11	132	40	233	59
42616PAISA	12	550	168	1683	433
4301ROBINS	10	109	64	210	47
4329VISTAH	10	46	6	138	39
43407ZAPAL	7	55	1	210	72
4708MCKELL	12	88	45	145	33
47107THSTR	10	90	44	154	39
4825MUNDY	10	71	37	115	29

PARAMETER: CADMIUM

METHOD: ATOMIC ABSORPTION
UNITS: PARTS PER MILLION

YEAR: 1975

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
4ROOSEVELT	2	86	55	116	43
4SACREDHEA	3	137	8	227	115
4SANJACINT	3	59	11	86	42
4STCLEMENT	3	58	9	109	50
4STPATRICK	3	83	11	130	64
4UTEP	3	63	20	108	44
4VILAS	3	179	12	325	158
4WESTERNHI	3	61	29	113	45
4WHITE	3	59	22	80	32
41218RANDO	1	42	42	42	
41409MUNDY	3	31	21	46	13
41730WPAIS	2	30	25	35	7
41838WPAIS	3	53	45	59	7
41844WPAIS	3	46	13	70	30
42473VFW	3	958	243	2050	961
42510STVRA	3	41	9	76	34
42616PAISA	3	483	285	653	186
4301ROBINS	3	97	61	160	55
4329VISTAH	1	15	15	15	
4708MCKELL	3	25	12	38	13
47107THSTR	2	115	36	193	111
4825MUNDY	1	20	20	20	

PARAMETER: LEAD

METHOD: ATOMIC ABSORPTION
UNITS: PARTS PER MILLION

YEAR: 1972

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
1ALAMO	6	217	100	400	117
1ADY	7	443	300	600	98
1BOWIE	6	425	200	600	133
1CORONADO	3	217	100	350	126
1CRISTOREY	7	5079	1700	11450	4336
1ELPASOHIG	7	643	250	1200	390
1FRANKLIN	3	400	400	400	0
1HART	6	233	50	450	160
1HOLYFAMIL	6	583	350	900	221
1JESUS&MAR	6	542	400	800	169
1LAMAR	5	193	65	400	130
1LINCOLN	4	263	100	500	170
1MESITA	7	306	50	640	216
1MOREHEAD	5	310	100	600	195
1PUTNAM	4	263	100	400	138
1ROBERTS	4	163	100	250	75
1ROOSEVELT	6	633	300	1600	509
1SACREDHEA	6	890	800	1000	85
1SANJACINT	6	567	100	1000	350
1STCLEMENT	6	1117	900	1300	147
1STIGNATIO	6	967	750	1200	183
1STMICHAEL	3	250	50	400	180
1STPATRICK	5	540	350	800	171
1UTEP	6	458	350	600	92
1VILAS	6	276	7	450	170
1WESTERNHI	4	188	100	250	63
1WHITE	5	180	50	350	115
1100MADELI	1	600	600	600	
1110WILLIE	2	1100	600	1600	707
11100MADEL	5	280	100	400	130
1113RITODE	5	3660	3100	4200	397
1119ACARLO	5	720	500	1200	295
1120WILLIE	5	1040	700	1500	321
11218RANDO	7	664	500	1000	193
11409MUNDY	7	1043	700	1400	223
1143CHURCH	7	236	100	400	118
11730WPAIS	7	271	50	600	182
11838WPAIS	7	329	200	600	138
11844WPAIS	7	620	500	800	107
1200CARLOS	1	1800	1800	1800	
1204WILLIE	4	2000	1800	2400	283
1216ACARLO	4	1675	300	3400	1284
12473VFW	7	3057	600	7200	2195
12510STVRA	4	338	100	450	160
12616PAISA	7	2221	1550	3600	723
1305SKANSA	1	600	600	600	
13210PIEDM	3	283	200	450	144

PARAMETER: LEAD

METHOD: ATOMIC ABSORPTION
UNITS: PARTS PER MILLION

YEAR: 1973

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
1ALAMO	12	256	100	1140	285
1ADY	12	335	150	550	127
1BOWIE	12	296	130	400	84
1CORONADO	12	78	30	150	37
1CRISTOREY	12	8195	3400	13860	3516
1ELPASOHIG	12	820	100	2100	619
1HART	12	206	100	300	60
1HOLYFAMIL	12	437	280	660	98
1JESUS&MAR	12	467	330	620	70
1KERNFIRES	1	460	460	460	
1LAMAR	12	282	70	1900	512
1LINCOLN	12	70	25	150	40
1MESITA	12	136	30	230	57
1MOREHEAD	12	91	30	180	40
1PUTNAM	12	105	30	200	42
1ROBERTS	12	73	30	150	40
1ROOSEVELT	12	423	260	630	111
1SACREDHEA	12	985	300	3300	752
1SANJACINT	12	297	160	440	77
1STCLEMENT	12	986	460	2100	428
1STIGNATIO	12	1168	400	2200	448
1STMICHAEL	12	98	30	230	57
1STPATRICK	12	517	370	730	96
1UTEP	12	603	280	2240	527
1VILAS	12	279	100	570	130
1WESTERNHI	12	74	15	150	41
1WHITE	12	101	30	180	37
11100MADEL	2	230	200	260	42
11219RANDO	12	355	50	700	242
11409MUNDY	12	986	635	1500	288
1148CDURCH	12	286	150	550	143
11730WPAIS	12	273	125	400	68
11838WPAIS	12	666	285	3770	962
11844WPAIS	12	623	300	1255	233
12473VFW	12	4740	1300	6400	1811
12510STVRA	12	311	150	470	98
12616PAISA	12	3345	1000	5850	1298
1301ROBINS	9	484	330	700	127
13210PIEDM	12	165	40	420	114

PARAMETER: LEAD

METHOD: ATOMIC ABSORPTION
UNITS: PARTS PER MILLION

YEAR: 1974

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
1ALAMO	12	144	20	270	73
1ADY	12	435	80	2582	718
1BOWIE	12	256	130	380	62
1BUENAVIST	12	879	20	10080	2898
1CORONADO	12	39	30	55	8
1CRISTOREY	12	5245	340	11760	3046
1ELPASOHIG	12	1094	390	2750	742
1HART	12	150	10	320	83
1HOLYFAMIL	12	422	150	670	158
1JESUS&MAR	12	540	330	740	116
1LAMAR	12	123	60	520	128
1LINCOLN	12	23	10	40	11
1MESITA	12	147	70	255	52
1MOREHEAD	12	66	50	100	16
1PUTNAM	12	82	50	170	31
1ROBERTS	12	26	10	40	11
1ROOSEVELT	12	341	220	572	104
1SACREDHEA	12	780	400	1120	198
1SANJACINT	12	315	140	460	89
1STCLEMENT	12	289	70	1000	253
1STIGNATIO	8	1663	620	7480	2359
1STMICHAEL	7	31	10	60	18
1STPATRICK	12	404	160	520	99
1UTEP	12	546	330	760	146
1VILAS	12	209	60	480	127
1WESTERNHI	12	30	10	80	17
1WHITE	12	95	50	190	41
11218PANDO	12	658	75	1290	378
11409MUNDY	12	776	520	1290	244
11730WPAIS	12	204	120	280	51
11838WPAIS	12	489	100	3300	888
11844WPAIS	12	548	380	710	95
12473VFW	11	5299	560	12852	3757
12510STVRA	12	296	50	620	166
12616PAISA	12	2645	800	5670	1497
1301ROBINS	12	488	60	1650	434

PARAMETER: LEAD

METHOD: ATOMIC ABSORPTION
UNITS: PARTS PER MILLION

YEAR: 1975

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
1ALAMO	3	408	260	530	137
1AOY	3	320	140	520	191
1BOWIE	3	287	270	310	21
1BUENAVIST	3	73	50	90	21
1CORONADO	3	140	50	300	139
1CRISTOREY	3	10937	9290	12800	1765
1ELPASOHIG	3	2000	1650	2630	547
1HART	3	127	40	200	81
1HOLYFAMIL	3	457	330	620	148
1JESUS&MAR	3	917	660	1320	354
1LAMAR	3	777	150	1950	1017
1LINCOLN	3	53	20	100	42
1MESITA	3	147	90	180	49
1MOREHEAD	3	87	80	90	6
1PUTNAM	3	427	80	1100	583
1ROBERTS	3	38	30	45	8
1ROOSEVELT	2	190	80	300	156
1SACREDHEA	3	705	305	950	349
1SANJACINT	3	323	240	410	85
1STCLEMENT	3	163	140	190	25
1STPATRICK	3	653	290	1240	513
1UTEP	3	400	180	620	220
1VILAS	3	533	180	1200	578
1WESTERNHI	3	119	20	308	163
1WHITE	3	126	80	160	41
11218RANDO	2	1120	1040	1200	113
11409MUNDY	3	609	550	630	66
11730WPAIS	3	223	100	290	107
11838WPAIS	3	270	100	360	147
11844WPAIS	3	500	380	570	104
12473VFW	3	9080	4620	12390	4011
12510STVRA	3	363	220	598	205
12616PAISA	3	4067	2970	4620	950
1301ROBINS	3	253	120	440	167

PARAMETER: LEAD

METHOD: ATOMIC ABSORPTION
UNITS: PARTS PER MILLION

YEAR: 1972

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
1329VISTAH	7	229	100	450	141
13407ZAPAL	7	164	50	350	107
1425MUNDY	2	300	200	400	141
1701TURNEY	4	188	50	400	155
1705SHILLS	7	283	200	400	96
1710MCKELL	5	226	100	330	92
17107THSTR	6	242	100	400	111
1805SKANSA	4	475	200	600	189
1825MUNDY	5	330	200	500	130
2ALAMO	7	124	34	230	81
2AUY	7	448	340	570	56
2BOWIE	7	330	288	380	33
2CORONADO	7	33	10	60	17
2CRISTOREY	7	4968	1560	12056	4439
2ELPASOHIG	7	645	70	1820	622
2FRANKLIN	4	196	136	250	58
2HART	7	134	37	220	55
2HOLYFAMIL	6	578	470	890	157
2JESUS&MAR	6	550	492	600	46
2LAMAR	7	82	50	112	21
2LINCOLN	7	24	8	40	13
2MESITA	7	227	120	348	103
2MOREHEAD	7	136	24	680	241
2PUTNAM	7	64	41	95	20
2ROBERTS	7	31	13	50	14
2ROOSEVELT	7	350	276	420	59
2SACREDHEA	6	962	800	1054	90
2SANJACINT	7	400	124	856	253
2STCLEMENT	6	1217	1040	1384	143
2STIGNATIO	6	1042	890	1200	120
2STMICHAEL	6	31	4	52	19
2STPATRICK	6	529	400	730	132
2UTEP	6	433	328	492	65
2VILAS	7	255	130	370	72
2WESTERNHI	7	21	4	50	16
2WHITE	6	44	4	85	33
2100MADELI	1	364	364	364	
2110WILLIE	2	1052	720	1384	470
21100MADOI	6	318	234	425	70
2113BRITTO	5	3568	2760	4000	500
2119ACAPLO	6	719	428	1300	344
2120WILLIE	5	1164	760	1800	457
2121BRANDO	7	742	615	888	102
21409MUNDY	7	1081	810	1280	158
2148CHURCH	7	224	150	340	68
21730WPAIS	7	257	190	340	52
21633WPAIS	7	331	168	450	84

PARAMETER: LEAD

METHOD: ATOMIC ABSORPTION
UNITS: PARTS PER MILLION

YEAR: 1973

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
1329VISTAH	12	266	225	330	37
13407ZAPAL	12	189	90	330	79
1701TURNEY	1	150	150	150	
1706SHILLS	11	295	130	430	33
1708MCKELL	9	193	80	330	87
17107THSTR	12	241	200	300	34
1825MUNDY	12	233	40	600	187
2ALAMO	12	198	68	670	159
2ACY	12	311	28	530	160
2BOWIE	12	393	120	1550	371
2CORONADO	12	36	10	60	19
2CRISTOREY	12	6021	3000	12200	2867
2ELPASOHIG	12	784	45	1560	467
2HART	12	190	130	280	46
2HOLYFAMIL	12	439	150	690	129
2JESUS&MAR	12	504	400	660	74
2KERNFIRES	1	570	570	570	
2LAMAR	12	206	40	1400	377
2LINCOLN	12	27	10	50	16
2MESITA	12	123	40	200	57
2MOREHEAD	12	64	18	115	28
2PUTNAM	12	67	18	115	32
2ROBERTS	12	41	10	99	26
2ROOSEVELT	12	389	37	630	169
2SACREDHEA	12	958	75	2700	612
2SANJACINT	12	305	220	460	79
2STCLEMENT	12	857	330	1600	342
2STIGNATIO	12	1044	500	1300	213
2STMICHAEL	12	72	10	186	55
2STPATRICK	12	523	310	730	136
2UTEP	12	433	254	660	106
2VILAS	12	269	110	540	120
2WESTERNHI	12	35	13	65	15
2WHITE	12	88	42	130	29
21100MADEL	2	290	270	310	28
21218RANDO	12	368	58	830	293
21409MUNDY	12	1011	480	1600	347
2148COURCH	12	269	110	980	232
21730WPAIS	12	238	22	370	93
21838WPAIS	12	369	32	610	149

PARAMETER: LEAD

METHOD: ATOMIC ABSORPTION
UNITS: PARTS PER MILLION

YEAR: 1974

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
1329VISTAH	11	331	140	1485	336
13407ZAPAL	11	103	60	170	34
1708MCKELL	12	351	240	500	81
17107THSTR	12	207	70	290	64
1325MUNDY	10	182	10	360	119
2ALAMO	12	196	75	515	124
2ADY	12	720	118	3680	1136
2BOWIE	12	300	30	495	110
2BUENAVIST	12	893	20	10100	2900
2CORONADO	12	40	10	100	28
2CRISTOREY	12	5399	248	11400	2892
2ELPASOHIG	12	1170	340	2700	641
2HART	12	214	24	655	151
2HOLYFAMIL	12	530	216	1350	299
2JESUS&MAR	12	562	336	785	144
2LAMAR	12	129	46	545	135
2LINCOLN	12	24	10	70	18
2MESITA	12	153	35	220	53
2MOREHEAD	12	62	16	146	37
2PUTNAM	12	79	29	151	38
2ROBERTS	12	27	10	61	18
2ROOSEVELT	12	390	264	630	108
2SACREDHEA	12	905	500	1170	186
2SANJACINT	12	369	218	460	72
2STCLEMENT	12	316	27	890	234
2STIGNATIO	8	1517	669	5700	1699
2STMICHAEL	7	24	11	44	13
2STPATRICK	12	462	253	610	109
2UTEP	12	638	310	860	161
2VILAS	12	214	60	390	38
2WESTERNHI	12	51	11	272	72
2WHITE	12	100	27	218	63
21216RANDO	12	643	22	1330	456
21409MUNDY	12	882	465	1980	410
21730WPAIS	12	224	118	340	69
21836WPAIS	12	557	191	3560	947

PARAMETER: LEAD

METHOD: ATOMIC ABSORPTION
UNITS: PARTS PER MILLION

YEAR: 1975

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
1329VISTAH	1	90	90	90	
1708MCKELL	2	217	160	280	60
17107THSTR	3	603	240	1320	621
1825MUNDY	1	310	310	310	
2ALAMO	3	333	174	482	154
2AOY	3	390	204	505	162
2BOWIE	3	367	332	386	30
2BUENAVIST	3	57	23	88	33
2CORONADO	3	77	20	168	79
2CRISTOREY	3	10667	9600	11600	1007
2ELPASOHIG	3	1837	1650	1940	162
2HART	3	151	48	302	134
2HOLYFAMIL	3	525	334	752	211
2JESUS&MAR	3	978	660	1370	361
2LAMAR	3	157	20	238	119
2LINCOLN	3	57	14	120	56
2MESITA	3	167	34	264	119
2MOREHEAD	3	104	32	148	63
2PUTNAM	3	87	20	165	73
2ROBERTS	3	57	20	116	52
2ROOSEVELT	2	241	57	425	260
2SACREDHEA	3	750	336	985	360
2SANJACINT	3	447	345	550	103
2STCLEMENT	3	179	165	186	12
2STPATRICK	3	687	445	1160	410
2UTEP	3	519	234	778	273
2VILAS	3	634	220	1440	698
2WESTERNHI	3	53	13	120	59
2WHITE	3	151	23	286	132
21218RANDO	2	1135	1060	1210	106
21409MUNDY	3	673	510	775	143
21730WPAIS	3	189	66	262	107
21838WPAIS	3	266	85	362	157

PARAMETER: LEAD

METHOD: ATOMIC ABSORPTION
UNITS: PARTS PER MILLION

YEAR: 1972

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
21844WPAIS	7	659	552	750	70
2200CARLOS	1	1568	1568	1568	
2204WILLIE	4	1910	1640	2120	200
2216ACARLO	4	1098	440	1480	456
22473VFW	7	3050	644	7254	2200
22510STVRA	6	180	29	500	179
22616PAISA	7	2404	1670	3888	910
2305SKANSA	1	752	752	752	
23210PIEDM	6	150	82	290	91
2329VISTAH	7	257	200	342	54
23407ZAPAL	7	103	65	128	23
2425MUNDY	2	296	252	340	62
2510STVRAI	1	36	36	36	
2701TURNEY	7	98	29	214	79
2706SHILLS	7	314	264	439	59
2710MCKELL	6	241	164	350	70
27107THSTR	7	201	95	268	60
2805SKANSA	4	454	340	630	129
2825MUNDY	5	359	240	470	98
3ALAMO	7	2869	648	11174	3690
3ADY	7	1918	1200	2500	381
3BOWIE	7	2151	1000	3000	691
3CORONADO	7	9797	962	29387	12709
3CRISTOREY	7	6126	3500	9000	1988
3ELPASOHIG	7	2907	2250	3500	438
3FRANKLIN	3	3429	2867	4400	843
3HART	7	1382	557	2800	788
3HOLYFAMIL	6	2220	1426	3500	843
3JESUS&MAR	6	3540	1777	5000	1244
3LAMAR	7	2697	600	9830	3281
3LINCOLN	4	450	100	1000	404
3MESITA	7	4611	2600	7824	1929
3MOREHEAD	7	357	200	1000	305
3PUTNAM	7	493	200	1250	366
3ROBERTS	7	698	200	1300	412
3ROOSEVELT	7	3936	2432	5215	1009
3SACREDHEA	6	3702	2355	4250	714
3SANJACINT	7	1812	1000	2883	682
3STCLEMENT	6	2183	1200	4158	1113
3STIGNATIU	6	1793	997	3315	845
3STMICHAEL	5	5140	1825	15000	5584
3STPATRICK	6	2967	2000	3500	582
3UTEP	6	3283	2000	4500	953
3VILAS	7	3777	2750	4950	792
3WESTERNHI	7	972	600	1602	339
3WHITE	6	10905	2250	22700	9235

PARAMETER: LEAD

METHOD: ATOMIC ABSORPTION
UNITS: PARTS PER MILLION

YEAR: 1973

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
21644WPAIS	12	1009	57	5050	1320
22473VFW	12	4816	1300	14300	3276
22510STVRA	12	341	180	520	117
22616PAISA	12	3369	1000	8600	2012
2301ROBINS	9	482	320	750	153
23210PIEDM	12	113	17	300	78
2329VISTAH	12	235	22	360	90
23407ZAPAL	12	150	53	278	75
2701TURNEY	1	200	200	200	
2766SHILLS	11	308	210	405	57
2708MCKELL	9	252	60	840	234
27107THSTR	12	229	140	300	48
2825MUNDY	12	232	10	600	196
3ALAMO	12	1215	100	2500	752
3ADY	12	1829	813	3058	712
3BOWIE	12	1855	809	2650	569
3CORONADO	11	1464	800	2538	495
3CRISTOREY	11	51622	30580	80758	15827
3ELPASOHIG	12	3419	2459	4672	682
3HART	12	1015	100	1600	404
3HOLYFAMIL	12	2412	1150	3968	944
3JESUS&MAR	12	5783	1000	13806	3412
3KERNFIRES	1	3600	3600	3600	
3LAMAR	12	1864	1350	2500	413
3LINCOLN	12	767	150	2242	587
3MESITA	12	3498	1467	5000	1107
3MOREHEAD	12	502	225	600	163
3PUTNAM	12	598	500	800	133
3ROBERTS	12	485	50	1000	236
3ROOSEVELT	12	2607	1584	4480	931
3SACREDHEA	12	3326	1900	5178	887
3SANJACINT	11	2300	746	4348	1047
3STCLEMENT	10	2342	1750	2750	348
3STIGNATIO	12	1308	100	2250	557
3STMICHAEL	12	2647	571	4244	1004
3STPATRICK	11	2681	1986	3250	393
3UTEP	12	4085	1652	7500	1577
3VILAS	11	3396	2500	4400	781
3WESTERNHI	11	797	500	1295	291
3WHITE	12	1988	450	3653	988

PARAMETER: LEAD

METHOD: ATOMIC ABSORPTION
UNITS: PARTS PER MILLION

YEAR: 1974

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
21844WPAIS	12	518	12	800	207
22473VEW	11	5427	655	14200	4092
22510STVPA	12	312	80	650	161
22616PAISA	12	2832	1040	6300	1477
2301ROBINS	12	605	71	2000	592
2329VISTAH	11	272	165	360	61
23407ZAPAL	11	121	55	220	44
2708MCKELL	12	385	282	520	73
27107THSTR	12	239	115	322	57
2625MUNDY	10	219	10	435	158
3ALAMO	12	860	300	2350	612
3ADY	12	1835	1022	3350	720
3BOWIE	12	1171	725	2113	392
3BUENAVIST	12	515	350	896	148
3CORONADO	12	1194	400	2324	556
3CRISTOREY	11	37077	64	69250	16981
3ELPASOHIG	12	3579	2038	5561	946
3HART	11	1045	600	2450	514
3HOLYFAMIL	11	1624	1100	2800	584
3JESUS&MAR	11	5520	932	11160	3639
3LAMAR	12	1422	100	2400	629
3LINCOLN	12	321	75	807	255
3MESITA	12	2191	816	4650	1064
3MOREHEAD	12	168	100	325	77
3PUTNAM	12	425	250	705	135
3ROBERTS	12	118	50	300	64
3ROOSEVELT	11	1893	484	2650	564
3SACREDHEA	12	3488	1850	5500	1232
3SANJACINT	9	1265	550	1629	426
3STCLEMENT	12	1814	1588	2050	155
3STIGNATIO	7	992	229	1840	530
3STMICHAEL	6	1432	1200	1650	207
3STPATRICK	12	2446	155	3500	988
3UTEP	10	2477	1327	5950	931
3VILAS	12	3845	1492	6564	1671
3WESTERNHI	11	454	245	899	202
3WHITE	11	3882	1225	12595	3780

PARAMETER: LEAD

METHOD: ATOMIC ABSORPTION
UNITS: PARTS PER MILLION

YEAR: 1975

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
21844WPAIS	3	543	475	600	63
22473VFW	3	9267	5000	12700	3917
22510STVFA	3	537	264	1040	436
22616PAISA	3	4177	2660	5720	1530
2301ROBINS	3	369	132	615	386
2329VISTAH	1	81	81	81	
2708MCKELL	3	235	164	280	62
27107THSTR	3	653	194	1340	606
2825MUNDY	1	475	475	475	
3ALAMO	3	767	100	1600	764
3ADY	3	1625	350	3000	1328
3BOWIE	3	1519	250	2506	1203
3BUENAVIST	3	448	195	800	314
3CORONADO	3	713	40	1699	873
3CRISTOREY	3	33196	21593	48345	13724
3ELPASOHIG	3	3615	745	5350	2504
3HART	3	1761	50	4784	2625
3HOLYFAMIL	3	1017	150	1800	828
3JESUS&MAR	3	4538	2200	6024	2049
3LAMAR	3	717	200	1700	852
3LINCOLN	3	131	40	252	109
3MESITA	3	2357	1550	2850	704
3MOREHEAD	3	183	150	250	56
3PUTNAM	3	277	90	550	242
3ROBERTS	3	67	50	100	29
3ROOSEVELT	2	1814	278	3350	2172
3SACREDHEA	3	4130	700	5850	2970
3SANJACINT	2	1250	300	2200	1344
3STCLEMENT	3	1495	400	2386	1009
3STPATRICK	3	2473	400	3520	1796
3UTEP	3	1933	153	3146	1575
3VILAS	3	4407	1500	7371	2936
3WESTERNHI	3	407	20	650	339
3WHITE	3	1353	570	1947	708

PARAMETER: LEAD

METHOD: ATOMIC ABSORPTION
UNITS: PARTS PER MILLION

YEAR: 1972

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
3100MADELI	1	2713	2713	2713	
3110WILLIE	1	12400	12400	12400	
31100MADEL	6	3521	858	6220	2131
3113RITODE	5	40562	29000	49849	7682
3119ACARLO	6	27480	17400	38498	7008
3120WILLIE	5	36180	2800	64484	25065
31218RANDO	7	4667	2000	8800	2264
31409MUNDY	7	1486	600	2200	525
3148CHURCH	7	716	200	1750	539
31730WPAIS	7	2425	1290	3525	824
31838WPAIS	7	3468	1094	7600	2526
31844WPAIS	6	2337	1632	3145	484
3200CARLOS	1	14520	14520	14520	
3204WILLIE	4	21940	10800	36800	11551
3216ACARLO	4	15818	7400	22860	6609
32473VFW	7	53202	32400	103700	25332
32510STVRA	6	2711	1760	5104	1220
32616PAISA	7	10170	7437	15000	3007
3305SKANSA	1	400	400	400	
33210PIEDM	5	18342	1059	84000	36710
3329VISTAH	7	675	200	1250	379
33407ZAPAL	6	1074	400	1953	520
3425MUNDY	2	2555	2150	2960	573
3510STVRAI	1	1200	1200	1200	
3701TURNEY	4	1261	560	2482	841
3706SHILLS	7	1407	600	2500	631
3710MCKELL	5	5552	4400	9000	1951
37107THSTR	7	3590	1606	6400	1699
3805SKANSA	4	2528	713	4800	1707
3825MUNDY	6	2496	1850	3200	533
4ALAMO	7	2002	1230	2581	513
4ADY	7	2271	1150	4200	966
4BOWIE	7	1774	940	2434	679
4CORONADO	7	6072	2000	16000	5961
4CRISTOREY	7	8439	5150	13200	2857
4ELPASOHIG	7	3699	2370	6600	1359
4FRANKLIN	3	3777	3130	4150	562
4HART	7	1554	695	2850	871
4HOLYFAMIL	6	2203	1055	3050	858
4JESUS&MAR	5	4369	1960	6000	1609
4LAMAR	7	1219	500	1842	435
4LINCOLN	7	276	50	735	293
4MESITA	7	4641	1400	8300	2490
4MOREHEAD	7	271	50	700	206
4PUTNAM	7	891	130	3850	1325
4ROBERTS	7	1657	295	6500	2221

PARAMETER: LEAD

METHOD: ATOMIC ABSORPTION
UNITS: PARTS PER MILLION

YEAR: 1973

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
31100MADEL	2	2971	2450	3491	736
31218RANDO	10	4875	1900	7623	2066
31409MUNDY	12	1299	750	2300	424
3148CHURCH	12	647	100	1150	337
31730WPAIS	11	1403	100	3550	1028
31838WPAIS	12	2354	1078	4192	859
31844WPAIS	11	7059	1000	51825	15028
32473VFW	12	76071	36300	131200	31339
32510STVRA	11	3603	284	6350	1789
32616PAISA	12	7951	3042	24150	5429
3301ROBINS	3	3886	1400	48000	15912
33210PIEDM	6	1655	500	5300	1825
3329VISTAH	11	802	250	2000	521
33407ZAPAL	12	898	100	1901	606
3706SHILLS	11	1140	500	1980	379
3708MCKELL	9	2349	1279	5650	1487
37107THSTR	11	2249	826	3100	618
3825MUNDY	11	2494	1366	5461	1182
4ALAMO	12	1142	400	2500	735
4ADY	12	1912	950	2750	576
4BOWIE	12	1912	750	2800	643
4CORONADO	12	1708	410	3600	909
4CRISTOREY	11	38300	4943	70555	18841
4ELPASOHIG	12	3394	1850	4450	749
4HART	12	890	400	1650	362
4HOLYFAMIL	12	1955	315	4050	1097
4JESUS&MAR	12	5010	850	5250	2219
4KERNFIRES	1	2750	2750	2750	
4LAMAR	12	1793	1050	2650	460
4LINCOLN	12	283	50	1000	290
4MESITA	12	3501	1875	5300	1173
4MOREHEAD	11	196	50	325	91
4PUTNAM	12	385	90	1100	274
4ROBERTS	12	148	50	470	151

PARAMETER: LEAD

METHOD: ATOMIC ABSORPTION
UNITS: PARTS PER MILLION

YEAR: 1974

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
3121BRANDO	7	1733	585	2603	774
31409MUNDY	12	1115	450	2973	675
31730WPAIS	3	741	200	1312	356
31638WPAIS	11	2706	1032	5173	1239
31844WPAIS	9	26048	823	225100	74645
32473VFW	12	51037	17827	93400	26328
32510STVRA	10	3309	2053	5500	1030
32616PAISA	12	8780	3777	17026	4511
3301ROBINS	9	2666	1350	3532	649
3329VISTAH	10	389	124	750	209
33407ZAPAL	7	274	135	650	177
3706MCKELL	11	1997	1126	3300	570
37107THSTF	10	1954	1000	2569	531
3825MUNDY	10	2095	1445	3000	510
4ALAMO	12	989	400	2600	660
4ADY	12	2111	934	4100	937
4BOWIE	12	1744	890	3300	881
4BUENAVIST	12	1198	287	7600	2040
4CORONADO	12	1527	635	2940	740
4CRISTOREY	12	47015	7777	72000	17168
4ELPASOHIG	12	4332	2925	6750	1188
4HART	11	1160	88	3600	893
4HOLYFAMIL	11	1879	360	3750	1012
4JESUS&MAR	11	6240	500	15000	4636
4LAMAR	12	1768	1000	2530	535
4LINCOLN	12	465	27	2520	701
4MESITA	12	2382	930	5100	1179
4MOREHEAD	12	208	35	700	183
4PUTNAM	12	548	170	975	279
4ROBERTS	11	143	5	725	200

PARAMETER: LEAD

METHOD: ATOMIC ABSORPTION
UNITS: PARTS PER MILLION

YEAR: 1975

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
31218RANDO	1	1765	1765	1765	
31409MUNDY	3	1617	950	2650	907
31730WPAIS	2	315	230	400	120
31838WPAIS	2	1863	1748	1977	162
31844WPAIS	2	1039	330	1747	1002
32473VFW	3	36082	5246	75550	35938
32510STVRA	3	1261	313	2000	863
32616PAISA	3	6875	6050	7574	770
3301ROBINS	2	5325	2600	8050	3854
3329VISTAH	1	196	196	196	
3703MCKELL	3	1197	250	1940	863
37107THSTR	2	2248	1300	3196	1341
3825MUNDY	1	410	410	410	
4ALAMO	3	835	260	1820	657
4AOY	3	1748	455	3050	1298
4BOWIE	3	1661	215	2413	1253
4BUENAVIST	3	546	403	810	229
4CORONADO	3	845	300	1906	919
4CRISTOREY	3	34467	24200	49200	13085
4ELPASOHIG	3	4218	705	6300	3060
4HART	3	2063	50	5470	2967
4HOLYFAMIL	3	1073	190	1950	880
4JESUS&MAR	3	5255	2275	7640	2732
4LAMAR	3	1605	115	2475	1296
4LINCOLN	3	117	30	166	44
4MESITA	3	2478	1470	3025	874
4MOREHEAD	3	162	135	175	23
4PUTNAM	3	782	350	1370	528
4ROBERTS	3	110	50	210	87

PARAMETER: LEAD

METHOD: ATOMIC ABSORPTION
UNITS: PARTS PER MILLION

YEAR: 1972

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
4ROOSEVELT	7	4047	3100	5233	793
4SACREDHEA	6	5620	3900	10300	2338
4SANJACINT	6	2085	1000	3340	827
4STCLEMENT	6	2024	860	2941	847
4STIGNATIO	6	1251	873	1500	240
4STMICHAEL	5	14007	1770	60000	25716
4STPATRICK	6	2977	1750	3950	772
4UTEP	6	3491	2200	4920	1013
4VILAS	7	4031	2770	5150	824
4WESTERNHI	7	1133	30	2628	773
4WHITE	6	13118	1010	36500	14128
4100MADELT	1	3333	3333	3333	
4110WILLIE	1	10900	10900	10900	
41100MADEL	6	2592	1640	3750	686
4113RITODE	5	39392	27500	45750	7372
4119ACARLO	4	24160	21250	25757	1992
4120WILLIE	5	33480	17900	64000	17868
41218RANDO	7	2759	325	6000	2044
41409MUNDY	7	2859	310	12200	4216
4148CHURCH	7	371	150	460	118
41730WPAIS	7	1323	230	2070	690
41838WPAIS	7	2411	280	3571	1080
41844WPAIS	7	2101	215	4000	1100
4200CARLOS	1	14800	14800	14800	
4204WILLIE	4	16800	10900	23200	5252
4216ACARLO	4	15125	14000	16200	1135
42473VFW	7	55846	35000	92420	21856
42510STVFA	6	2433	1200	4700	1369
42616PAISA	7	8104	760	12100	3798
4305SKANSA	1	1950	1950	1950	
43210PIEDM	5	7280	880	28300	11784
4329VISTAH	7	368	70	1060	327
43407ZAPAL	6	830	65	2670	955
4425MUNDY	2	2000	1950	2050	71
4510STVRAI	1	2330	2330	2330	
4701TURNEY	3	1192	475	2080	816
4706SHILLS	7	1829	425	8000	2737
4710MCKELL	5	5730	3800	10300	2693
47107THSTR	7	4057	1300	7700	2133
4805SKANSA	4	1056	650	1500	431
4825MUNDY	4	1850	200	2750	1132

PARAMETER: LEAD

METHOD: ATOMIC ABSORPTION
UNITS: PARTS PER MILLION

YEAR: 1973

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
4ROOSEVELT	12	2699	1385	4300	982
4SACREDHEA	12	3066	1500	4643	848
4SANJACINT	12	1676	950	2500	457
4STCLEMENT	10	2203	900	2800	653
4STIGNATIO	12	1190	80	2000	519
4STMICHAEL	12	2646	1294	4300	951
4STPATRICK	12	2752	1928	3450	470
4UTEP	12	3978	1750	9200	2062
4VILAS	11	3348	2325	4550	398
4WESTERNHI	12	1224	150	5300	1516
4WHITE	12	1899	550	3100	649
41100MADEL	2	3850	2600	5100	1768
41218RANDO	10	4026	545	7000	2137
41409MUNDY	12	1213	130	2846	826
4148CHURCH	12	426	27	900	273
41730WPAIS	12	1134	182	2885	820
41838WPAIS	12	2791	212	7050	1720
41844WPAIS	12	4092	222	33600	9320
42473VFW	12	61959	8900	102000	28219
42510STVRA	12	2780	300	7100	2107
42616PAISA	12	7227	472	15400	3667
4301ROBINS	8	3171	550	5555	1917
43210PIEDM	7	637	182	1660	484
4329VISTAH	12	491	50	1000	300
43407ZAPAL	10	281	50	700	250
4706SHILLS	11	1012	600	1866	392
4708MCKELL	9	2447	310	5950	1613
47107THSTR	12	2390	1500	2850	468
4825MUNDY	11	1967	295	2450	611

PARAMETER: LEAD

METHOD: ATOMIC ABSORPTION
UNITS: PARTS PER MILLION

YEAR: 1974

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
4ROOSEVELT	11	1960	166	3050	835
4SACREDHEA	12	3984	2025	6800	1452
4SANJACINT	11	1616	233	4400	1215
4STCLEMENT	12	2227	1037	4000	726
4STIGNATIO	7	1901	880	5000	1512
4STMICHAEL	6	1856	1500	2143	210
4STPATRICK	12	3207	766	4400	968
4UTEP	10	2947	1183	4250	1075
4VILAS	12	4163	1820	8235	1927
4WESTERNHI	11	701	280	2000	537
4WHITE	11	5362	1428	15086	4348
41218RANDO	7	1833	820	3220	854
41409MUNDY	12	1455	695	4000	894
41730WPAIS	8	830	466	1320	274
41838WPAIS	11	3239	1861	6000	1345
41844WPAIS	9	1541	850	3750	904
42473VFW	12	58513	19100	95000	27790
42510STVRA	12	3481	90	5655	1823
42616PAISA	12	9643	4906	17664	4696
4301ROBINS	10	3424	2666	4550	574
4329VISTAH	10	492	118	875	244
43407ZAPAL	7	328	14	800	259
4708MCKELL	12	2184	1150	3250	533
47107THSTR	10	2280	150	5333	1368
4825MUNDY	10	2359	1766	2825	384

PARAMETER: LEAD

METHOD: ATOMIC ABSORPTION
UNITS: PARTS PER MILLION

YEAR: 1975

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
4ROOSEVELT	2	1988	500	3475	2104
4SACREDHEA	3	4313	690	6150	3138
4SANJACINT	3	997	30	2360	1215
4STCLEMENT	3	1520	490	2520	936
4STPATRICK	3	2590	565	3620	1754
4UTEP	3	2198	200	5325	1735
4VILAS	3	4357	1460	7050	2801
4WESTERNHI	3	486	333	775	250
4WHITE	3	1455	660	2400	880
41218RANDO	1	2075	2075	2075	
41409MUNDY	3	1713	1000	3025	1137
41730WPAIS	2	355	250	460	148
41838WPAIS	3	4333	2141	8560	3657
41844WPAIS	3	1472	440	2250	931
42473VFW	3	37405	10465	74000	32849
42510STVRA	3	1451	525	2030	811
42616PAISA	3	8595	6200	10065	2095
4301ROBINS	3	5200	2875	9800	3984
4329VISTAH	1	285	285	285	
4708MCKELL	3	1233	285	1875	838
47107THSTR	2	2695	2525	2865	240
4825MUNDY	1	430	430	430	

PARAMETER: ZINC

METHOD: ATOMIC ABSORPTION
UNITS: PARTS PER MILLION

YEAR: 1972

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
1ALAMO	7	119	20	240	71
1ADY	7	377	240	540	106
1BOWIE	7	469	395	525	52
1CORONADO	5	48	35	60	12
1CRISTOREY	7	3196	1040	7325	2633
1ELPASOHIG	7	265	85	440	133
1FRANKLIN	4	160	100	200	43
1HART	7	201	110	260	52
1HOLYFAMIL	6	408	340	535	71
1JESUS&MAR	6	365	300	420	42
1LAMAR	7	69	10	110	31
1LINCOLN	5	60	25	160	56
1MESITA	7	324	200	460	83
1MOREHEAD	7	63	20	120	31
1PUTNAM	6	56	40	65	12
1ROBERTS	5	56	35	120	36
1ROOSEVELT	7	384	265	480	82
1SACREDHEA	6	1020	900	1115	72
1SANJACINT	7	404	60	760	275
1STCLEMENT	6	663	570	795	84
1STIGNATIO	6	1013	860	1160	101
1STMICHAEL	6	56	15	200	71
1STPATRICK	6	400	340	480	53
1UTEP	6	269	180	360	64
1VILAS	7	514	10	805	264
1WESTERNHI	7	57	20	160	47
1WHITE	4	70	60	80	9
1100MADELI	1	320	320	320	
1110WILLIE	2	1120	720	1520	566
11100MADEL	6	240	135	310	59
1113RITODE	5	3582	2580	4190	718
1110ACARLO	5	1011	540	1915	564
1120WILLIE	5	1130	660	1750	465
11218RANDO	7	469	315	600	105
11409MUNDY	7	641	420	760	111
1148CHURCH	7	200	120	260	55
11730WPAIS	7	264	120	420	115
11838WPAIS	7	193	120	250	53
11844WPAIS	7	444	395	480	36
1200CARLOS	1	960	960	960	
1204WILLIE	4	1750	1400	2040	268
1216ACARLO	4	990	440	1200	367
12473VFW	7	1636	460	3755	1084
12510STVRA	5	187	20	450	194
12616PAISA	7	2339	1320	3760	1039
13055KANSA	1	600	600	600	
13210PIEDM	5	188	60	400	135

PARAMETER: ZINC

METHOD: ATOMIC ABSORPTION
UNITS: PARTS PER MILLION

YEAR: 1973

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
1ALAMO	12	138	55	190	42
1ADY	12	340	160	585	146
1BOWIE	12	446	325	890	151
1CORONADO	12	35	15	50	12
1CRISTOREY	12	5422	2600	8610	2011
1ELPASOHIG	12	343	90	540	154
1HART	12	253	170	355	63
1HOLYFAMIL	12	358	270	540	73
1JESUS&MAR	12	348	280	530	63
1KERNFIRES	1	350	350	350	
1LAMAR	12	88	65	120	19
1LINCOLN	12	39	15	70	14
1MESITA	12	207	60	420	116
1MOREHEAD	12	103	50	160	33
1PUTNAM	12	67	40	90	14
1ROBERTS	12	33	15	50	11
1ROOSEVELT	12	394	105	560	124
1SACREDHEA	12	1145	410	3285	703
1SANJACINT	12	369	250	770	136
1STCLEMENT	12	556	335	870	204
1STIGNATIO	12	1094	405	1420	270
1STMICHAEL	12	45	15	105	27
1STPATRICK	12	407	315	505	67
1UTEP	12	477	285	665	130
1VILAS	12	425	100	980	218
1WESTERNHI	12	83	35	385	96
1WHITE	12	70	60	85	8
11100MADEL	2	265	200	330	92
11218RANDO	12	247	75	540	171
11409MUNDY	12	614	390	825	147
1148COURCH	12	275	180	750	155
11730WPAIS	12	296	160	450	81
11838WPAIS	12	276	200	500	91
11844WPAIS	12	504	210	1445	312
12473VFW	12	2592	770	3980	941
12510STVRA	12	228	110	370	79
12616PAISA	12	3076	1085	5775	1171
13015OBINS	9	292	210	385	57
13210PIEDM	12	123	40	370	94

PARAMETER: ZINC

METHOD: ATOMIC ABSORPTION
UNITS: PARTS PER MILLION

YEAR: 1974

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
1ALAMO	12	188	60	340	101
1ADY	12	239	112	460	91
1BOWIE	12	435	245	770	148
1BUENAVIST	12	794	25	8850	2537
1CORONADO	12	27	10	42	8
1CRISTOREY	12	3976	190	7980	2442
1ELPASOHIG	12	585	280	1444	345
1HART	12	171	20	320	92
1HOLYFAMIL	12	333	140	595	132
1JESUS&MAR	12	405	270	510	69
1LAMAR	12	69	55	155	28
1LINCOLN	12	35	10	58	13
1MESITA	12	213	65	570	145
1MOREHEAD	12	476	65	3870	1075
1PUTNAM	12	66	45	120	20
1ROBERTS	12	46	20	75	16
1ROOSEVELT	12	373	230	649	126
1SACREDHEA	12	877	550	1155	175
1SANJACINT	12	350	205	455	83
1STCLEMENT	12	196	40	590	155
1STIGNATIO	8	973	770	1380	200
1STMICHAEL	7	39	10	100	30
1STPATRICK	12	395	230	480	67
1UTEP	12	473	250	660	124
1VILAS	12	286	105	675	160
1WESTERNHI	12	50	22	90	18
1WHITE	12	72	45	115	21
1121BRANDO	12	473	60	805	243
11409MUNDY	12	451	275	800	151
11730WPAIS	12	237	140	321	59
11838WPAIS	12	385	80	2530	678
11844WPAIS	12	409	341	530	49
12473VFW	11	2710	345	6225	1958
12510STVRA	12	234	25	480	129
12616PAISA	12	2721	600	6050	1520
1301ROBINS	12	437	115	1980	529

PARAMETER: ZINC

METHOD: ATOMIC ABSORPTION
UNITS: PARTS PER MILLION

YEAR: 1975

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
1ALAMO	3	328	315	338	12
1ADY	3	323	150	462	159
1BOWIE	3	488	390	660	149
1BUENAVIST	3	117	78	188	62
1CORONADO	3	338	30	950	530
1CRISTOREY	3	8453	7517	9240	871
1ELPASOHIG	3	623	392	864	236
1HART	3	151	45	258	107
1HOLYFAMIL	3	367	242	480	120
1JESUS&MAR	3	1402	495	3080	1455
1LAMAR	3	630	90	1775	950
1LINCOLN	3	123	32	275	132
1MESITA	3	162	80	210	71
1MOREHEAD	3	245	142	332	96
1PUTNAM	3	732	50	2075	1163
1ROBERTS	3	55	49	65	9
1ROOSEVELT	2	175	70	280	148
1SACREDHEA	3	1088	960	1317	199
1SANJACINT	3	335	265	440	93
1STCLEMENT	3	104	90	122	16
1STPATRICK	3	355	260	405	82
1UTEP	3	282	60	500	220
1VILAS	3	436	248	790	298
1WESTERNHI	3	174	30	462	249
1WHITE	3	95	80	105	13
11218RANDO	2	810	740	880	99
11409MUNDY	3	368	320	435	60
11730WPAIS	3	222	125	272	84
11838WPAIS	3	189	108	235	71
11844WPAIS	3	415	375	460	43
12473VFW	3	3971	2087	5262	1669
12510STVRA	3	551	205	1229	587
12616PAISA	3	3744	2805	4227	813
1301ROBINS	3	203	120	295	88

PARAMETER: ZINC

METHOD: ATOMIC ABSORPTION
UNITS: PARTS PER MILLION

YEAR: 1972

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
1329VISTAH	7	389	190	1175	351
13407ZAPAL	7	196	120	260	57
1425MUNDY	2	230	160	300	99
1701TURNEY	6	94	40	175	56
1706SHILLS	7	357	25	530	158
1710MCKELL	6	195	120	250	49
17107THSTR	7	156	105	200	32
1805SKANSA	4	625	460	1000	252
1825MUNDY	5	289	200	360	59
2ALAMO	7	124	70	185	53
2ADY	7	505	362	620	97
2BOWIE	7	518	50	706	213
2CORONADO	7	37	28	52	9
2CRISTOREY	7	3576	1136	8779	3022
2ELPASOHIG	7	301	89	500	151
2FRANKLIN	4	173	144	200	26
2HART	7	224	154	290	49
2HOLYFAMIL	6	469	376	649	97
2JESUS&MAR	6	335	40	438	148
2LAMAR	7	79	54	102	14
2LINCOLN	7	42	[illegible]	53	12
2MESITA	7	398	212	540	117
2MOREHEAD	7	153	[illegible]	[illegible]	74
2PUTNAM	7	[illegible]	[illegible]	[illegible]	49
2ROBERTS	7	[illegible]	[illegible]	[illegible]	[illegible]
2ROOSEVELT	7	376	[illegible]	[illegible]	161
2SACREDHEA	6	1087	940	1292	121
2SANJACINT	7	456	70	920	291
2STCLEMENT	6	787	670	949	115
2STIGNATIO	6	1119	1000	1192	79
2STMICHAEL	6	39	27	48	9
2STPATRICK	6	472	340	606	94
2UTEP	6	308	224	412	65
2VILAS	7	719	400	1009	189
2WESTERNHI	7	59	29	110	31
2WHITE	6	67	45	88	18
2100MADELI	1	340	340	340	
2110WILLIE	2	1120	720	1520	566
21100MADEL	6	269	153	330	66
2113BRITONE	5	3502	2680	4300	584
2119ACARLO	5	996	430	1940	601
2120WILLIE	5	1123	600	1650	444
2121GRANDO	7	571	424	700	111
21409MUNDY	7	745	450	909	151
2148CHURCH	7	256	159	360	83
21730WPAIS	7	332	176	528	114
21838WPAIS	7	290	134	420	100

PARAMETER: ZINC

METHOD: ATOMIC ABSORPTION
UNITS: PARTS PER MILLION

YEAR: 1973

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
1329VISTAH	12	878	350	1860	543
13407ZAPAL	12	187	120	270	50
1701TURNEY	1	155	155	155	
1706SHILLS	11	399	290	625	95
1708MCKELL	9	168	100	295	59
17107THSTR	12	228	150	300	49
1825MUNDY	12	233	30	665	193
2ALAMO	12	144	48	200	45
2AGY	12	382	168	730	178
2BOWIE	12	517	347	930	186
2CORONADO	12	33	10	55	13
2CRISTOREY	12	5136	2282	9990	2517
2ELPASOHIG	12	367	52	550	172
2HART	12	267	166	379	62
2HOLYFAMIL	12	380	272	625	92
2JESUS&MAR	12	353	38	530	122
2KERNFIRES	1	380	380	380	
2LAMAR	12	77	22	112	24
2LINCOLN	12	44	17	77	19
2MESITA	12	207	5	565	153
2MOREHEAD	12	106	45	166	35
2PUTNAM	12	71	39	95	16
2ROBERTS	12	43	7	80	21
2ROOSEVELT	12	478	244	685	125
2SACREDHEA	12	1090	89	2950	561
2SANJACINT	12	407	250	865	174
2STCLEMENT	12	557	352	935	201
2STIGNATIO	12	1124	367	1400	277
2STMICHAEL	12	47	15	92	23
2STPATRICK	12	448	312	630	99
2UTEP	12	485	260	665	110
2VILAS	12	375	87	639	184
2WESTERNHI	12	43	19	69	17
2WHITE	12	85	41	107	17
21100MADEL	2	220	210	229	13
21218RANDO	12	390	52	620	210
21409MUNDY	12	658	360	929	189
2148CHURCH	12	247	157	380	61
21730WPAIS	12	317	216	570	89
21838WPAIS	12	289	210	450	79

PARAMETER: ZINC

METHOD: ATOMIC ABSORPTION
UNITS: PARTS PER MILLION

YEAR: 1974

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
1329VISTAH	11	2008	2	7480	1983
13407ZAPAL	11	167	42	495	120
1708MCKELL	12	269	190	440	85
17107THSTR	12	191	40	300	54
1825MUNDY	10	167	30	320	107
2ALAMO	12	219	56	415	134
2ACY	12	275	108	478	110
2BOWIE	12	498	344	765	127
2BUENAVIST	12	360	56	9490	2718
2CORONADO	12	33	15	63	12
2CRISTOREY	12	4341	159	9535	2479
2ELPASOHIG	12	647	244	1438	367
2HART	12	205	22	395	111
2HOLYFAMIL	12	440	138	1130	265
2JESUS&MAR	12	453	244	685	109
2LAMAR	12	77	49	194	42
2LINCOLN	12	41	15	71	18
2MESITA	12	224	76	632	154
2MOREHEAD	12	679	42	5990	1679
2PUTNAM	12	64	28	105	24
2ROBERTS	12	49	15	81	22
2ROOSEVELT	12	413	248	715	144
2SACREDHEA	12	1010	635	1395	215
2SANJACINT	12	410	300	535	77
2STCLEMENT	12	219	13	648	166
2STIGNATIO	8	1006	799	1250	167
2STMICHAEL	7	35	15	68	18
2STPATRICK	12	470	290	665	116
2UTEP	12	559	225	750	156
2VILAS	12	281	72	488	113
2WESTERNHI	12	58	26	94	21
2WHITE	12	86	50	150	35
2121BRANDO	12	521	80	945	297
21409MUNDY	12	501	328	1000	187
21730WPAIS	12	262	140	427	95
21836WPAIS	12	431	123	2730	728

PARAMETER: ZINC

METHOD: ATOMIC ABSORPTION
UNITS: PARTS PER MILLION

YEAR: 1975

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
1329VISTAH	1	98	98	98	
1708MCKELL	3	170	130	200	36
17107THSTR	3	302	180	520	189
1825MUNDY	1	250	250	250	
2ALAMO	3	352	289	394	56
2AOY	3	456	294	625	166
2BOWIE	3	735	482	1178	385
2BUENAVIST	3	135	78	211	55
2CORONADO	3	49	34	63	15
2CRISTOREY	3	8161	7340	8905	785
2ELPASOHIG	3	731	483	1100	326
2HART	3	157	54	237	94
2HOLYFAMIL	3	632	290	995	353
2JESUS&MAR	3	1576	583	3410	1590
2LAMAR	3	341	129	685	300
2LINCOLN	3	59	38	69	18
2MESITA	3	110	22	229	107
2MOREHEAD	3	159	51	274	112
2PUTNAM	3	76	56	106	26
2ROBERTS	3	68	56	75	10
2ROOSEVELT	2	263	96	430	236
2SACREDHEA	3	1201	1048	1410	187
2SANJACINT	3	504	440	560	60
2STCLEMENT	3	115	113	116	2
2STPATRICK	3	453	427	478	26
2UTEP	3	405	67	645	301
2VILAS	3	541	305	945	351
2WESTERNHI	3	39	36	43	4
2WHITE	3	121	70	158	45
21218RANDO	2	913	815	1010	138
21409MUNDY	3	428	366	470	55
21730WPAIS	3	257	151	334	95
21838WPAIS	3	217	122	270	82

PARAMETER: ZINC

METHOD: ATOMIC ABSORPTION
UNITS: PARTS PER MILLION

YEAR: 1972

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
21844WPAIS	7	511	428	592	54
2200CARLOS	1	880	880	830	
2204WILLIE	4	1954	1576	2320	306
2216ACARLO	4	1097	420	1440	461
22473VFW	7	1792	334	4259	1272
22510STVRA	6	235	44	690	269
22616PAISA	7	2719	1520	4800	1366
2305SKANSA	1	660	660	660	
23210PIEDM	6	132	60	236	72
2329VISTAH	7	430	210	1176	337
23407ZAPAL	7	264	72	495	135
2425MUNDY	2	226	200	252	37
2510STVRAI	1	29	29	29	
2701TURNEY	7	97	53	198	65
2706SHILLS	7	353	46	504	161
2710MCKELL	6	226	143	290	55
27107THST-	7	178	130	232	37
2805SKANSA	4	528	384	600	100
2825MUNDY	5	379	312	442	54
3ALAMO	7	1295	836	1800	361
3AOY	7	2013	1425	2350	405
3BOWIE	7	1616	1020	2000	373
3CORONADO	7	2313	1924	3300	484
3CRISTOREY	7	4683	2800	6550	1338
3ELPASOHIG	7	1684	1400	2100	240
3FRANKLIN	3	4741	2974	7290	2262
3HART	7	1270	840	2200	509
3HOLYFAMIL	6	2482	1275	3775	922
3JESUS&MAR	6	4037	2893	6260	1448
3LAMAR	7	1511	540	3300	876
3LINCOLN	7	1888	240	6250	2229
3MESITA	7	3673	1920	6250	1645
3MOREHEAD	7	246	110	440	105
3PUTNAM	7	405	200	1350	416
3ROBERTS	7	321	200	450	85
3ROOSEVELT	7	3626	3006	4400	495
3SACREDHEA	6	3766	2355	4525	733
3SANJACINT	7	3344	1117	11621	3721
3STCLEMENT	6	9563	3700	20950	6316
3STIGNATIO	5	1650	1242	1999	246
3STMICHAEL	5	2146	1663	2650	408
3STPATRICK	6	2499	1480	3900	861
3UTEP	6	3179	2140	5200	1097
3VILAS	7	3166	2291	4140	584
3WESTERNHI	7	4977	1623	14020	5098
3WHITE	5	63170	46200	83675	12585

PARAMETER: ZINC

METHOD: ATOMIC ABSORPTION
UNITS: PARTS PER MILLION

YEAR: 1973

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
21644NPAIS	12	541	192	1132	222
22473VFW	12	2979	710	10800	2623
22510STVRA	12	272	125	450	90
22616PAISA	12	3759	1170	7060	1926
2301ROBINS	9	311	218	495	83
23210PIERM	12	103	26	220	72
2329VISTAH	12	943	415	2510	632
23407ZAPAL	12	199	118	254	44
2701TURNEY	1	183	183	183	
2706SHILLS	11	444	320	585	56
2708MCKELL	9	178	106	256	52
27107THSTR	12	225	49	324	69
2825MUNDY	12	279	24	820	239
3ALAMO	12	1215	600	2425	639
3ADY	12	1847	936	2575	452
3BOWIE	12	1643	1150	2075	307
3CORONADO	11	1355	450	2400	504
3CRISTOREY	11	29644	22125	42939	5438
3ELPASOHIG	12	2934	1750	7425	1531
3HART	12	1173	600	2250	574
3HOLYFAMIL	12	2886	1675	4325	844
3JESUS&MAR	12	2471	800	4400	388
3KERNFIRES	1	2500	2500	2500	
3LAMAR	12	1980	1204	3250	648
3LINCOLN	12	3229	300	12500	4007
3MESITA	12	4074	1964	8250	1895
3MOREHEAD	12	468	175	1050	286
3PUTNAM	12	329	150	550	101
3ROBERTS	12	252	25	700	203
3ROOSEVELT	12	2669	1600	3825	739
3SACREDHEA	12	4128	2400	8250	1572
3SANJACINT	11	2629	1643	4320	913
3STCLEMENT	10	6066	2975	10157	2104
3STIGNATIO	12	1417	875	1766	236
3STMICHAEL	12	2174	1200	2575	462
3STPATRICK	11	4703	2450	19758	5052
3UTEP	12	4157	3025	6200	977
3VILAS	11	3437	2400	5350	990
3WESTERNHI	11	1669	1020	2720	524
3WHITE	12	21826	1950	84044	29152

PARAMETER: ZINC

METHOD: ATOMIC ABSORPTION
UNITS: PARTS PER MILLION

YEAR: 1974

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
21844WPAIS	12	443	294	517	68
22473VFW	11	3013	360	7188	2226
22510STVRA	12	249	53	563	147
22616PAISA	12	3236	705	7238	1891
2301ROBINS	12	514	107	2285	594
2329VISTAH	11	2864	408	10985	2886
23407ZAPAL	11	176	39	506	122
2708MCKELL	12	278	233	405	49
27107THSTR	12	221	143	295	48
2825MUNDY	10	221	19	424	146
3ALAMO	12	1016	450	2050	545
3AOY	12	2094	650	3200	757
3BOWIE	12	1404	490	2893	655
3BUENAVIST	12	744	300	1480	367
3CORONADO	12	1207	440	2122	527
3CRISTOREY	11	24569	14599	41423	8477
3ELPASOHIG	12	2531	1240	4104	708
3HART	11	1134	325	2125	479
3HOLYFAMIL	11	1788	950	3440	833
3JESUS&MAR	11	3233	1724	6250	1521
3LAMAR	12	1472	500	3001	660
3LINCOLN	12	832	210	2320	598
3MESITA	12	2420	1045	3600	623
3MOREHEAD	12	303	90	850	218
3PUTNAM	12	477	250	1455	323
3ROBERTS	12	169	25	400	106
3ROOSEVELT	11	2211	1381	3226	643
3SACREDHEA	12	3825	1350	6300	1656
3SANJACINT	9	2117	900	4664	1084
3STCLEMENT	12	4730	3300	9400	1846
3STIGNATIO	7	1527	950	2500	530
3STMICHAEL	6	1854	1200	2700	508
3STPATRICK	12	2546	1175	4450	895
3UTEP	10	3617	2300	6250	1236
3VILAS	12	2977	1526	4685	1047
3WESTERNHI	11	3521	350	18883	5429
3WHITE	11	13954	7374	23338	5762

PARAMETER: ZINC

METHOD: ATOMIC ABSORPTION
UNITS: PARTS PER MILLION

YEAR: 1975

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
218444PAIS	3	508	440	615	94
22473VFW	3	4381	2010	6238	2160
22510STVRA	3	396	216	742	300
22616PAISA	3	3934	2425	5140	1402
2301ROBINS	2	497	100	1150	570
2329VISTAH	1	102	102	102	
2708MCKELL	3	197	161	226	33
27107THSTR	3	367	210	635	233
2825MUNDY	1	422	422	422	
3ALAMO	3	847	90	1600	755
3ADY	3	1583	425	2650	1115
3BOWIE	3	1330	240	2050	960
3BUENAVIST	3	729	400	1300	496
3CORONADO	3	920	20	2083	1061
3CRISTOREY	3	25924	18764	39819	12035
3ELPASOHIG	3	2864	802	4450	1370
3HART	3	1604	50	4212	2272
3HOLYFAMIL	3	1125	175	2075	950
3JESUS&MAR	3	5292	3760	6827	1534
3LAMAR	3	1057	100	2500	1272
3LINCOLN	3	315	40	630	297
3MESITA	3	2649	2325	2875	288
3MOREHEAD	3	467	300	575	146
3PUTNAM	3	208	75	400	170
3ROBERTS	3	67	25	125	52
3ROOSEVELT	2	1645	139	3150	2129
3SACREDHEA	3	3973	350	5270	3139
3SANJACINT	2	2040	140	3940	2687
3STCLEMENT	3	9522	140	21715	11059
3STPATRICK	3	1713	350	4340	2276
3UTEP	3	1020	77	2525	1317
3VILAS	3	3393	610	6079	2736
3WESTERNHI	3	1302	30	2625	1298
3WHITE	3	6933	1767	11267	4804

PARAMETER: ZINC

METHOD: ATOMIC ABSORPTION
UNITS: PARTS PER MILLION

YEAR: 1972

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
3100MADELI	1	6510	6510	6510	
3110WILLIE	1	11000	11000	11000	
31100MADEL	6	11155	2487	31630	10803
3113PITODE	5	25650	17580	31812	5158
3119ACARLO	6	18350	900	27616	9910
3120WILLIE	5	25828	2080	64428	23595
3121BRANDO	7	1914	1172	2920	681
31409MUNDY	7	1084	560	1654	436
3148CHURCH	7	622	320	920	226
31730WPAIS	7	7631	1199	38064	13457
31835WPAIS	7	1975	1315	3277	676
31844WPAIS	6	6519	2480	15058	4102
3200CARLOS	1	10120	10120	10120	
3204WILLIE	4	24365	14340	46200	14548
3215ACARLO	4	10642	6960	12567	2506
32473V	7	25639	15400	37650	9625
32510STVRA	5	46691	8750	148700	58182
32616PAISA	7	13988	6980	20850	3875
3305SKANSA	1	520	520	520	
33210PIEDM	5	8348	1160	20920	8725
3329VISTAH	7	369	200	720	179
33407ZAPAL	6	1034	220	1743	526
3425MUNDY	2	2445	1450	5440	2821
3510STVRAI	1	131200	131200	131200	
3701TURNEY	4	1487	740	2730	894
3706SHILLS	7	1367	920	2025	391
3710MCKELL	5	3790	2063	6000	1304
37107THSTR	7	8941	4250	25772	7762
3805SKANSA	4	1465	678	2900	986
3825MUNDY	6	4034	2768	7920	1920
4ALAMO	7	2325	1565	3040	499
4ADY	7	2609	1600	3500	727
4BOWIE	7	1726	900	2550	569
4CORONADO	7	2746	2200	3700	485
4CRISTOREY	7	6152	3850	9300	2202
4ELPASOHIG	7	2211	1900	2550	214
4FRANKLIN	3	3942	3375	4400	591
4HART	7	1947	1015	3600	947
4HOLYFAMIL	6	2480	1535	4540	1057
4JESUS&MAR	6	4422	3260	5750	821
4LAMAR	7	1565	1070	1970	344
4LINCOLN	7	2292	160	6865	2375
4MESITA	7	4447	2550	6615	1579
4MOREHE	7	410	240	775	137
4PUTNAM	7	1139	280	4450	1520
4ROBERTS	7	1146	280	3500	1141

PARAMETER: ZINC

METHOD: ATOMIC ABSORPTION
UNITS: PARTS PER MILLION

YEAR: 1973

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
31100MADEL	2	7853	7166	8539	971
3121GRANDE	10	2743	1625	6363	1376
3140RMUNEY	12	1114	675	1821	363
3143CHURCH	12	750	240	1425	350
31730WPAIS	11	2166	450	9773	2512
31836WPAIS	12	2003	612	2956	672
31844WPAIS	11	1965	900	5076	785
32473VEH	12	32003	16975	48438	10359
32510STWEA	11	4953	1917	19558	4954
32616PAISA	12	10797	7699	15225	2465
3301ROBINS	9	3363	794	14200	4419
33210PIEDR	6	3393	750	13572	5072
3329VISTAH	11	735	250	2200	562
33407ZAPAL	12	504	26	1326	377
3706SHILLS	11	1671	1051	2226	355
3708MCKELL	9	2367	1250	6450	1649
37107THSTR	11	6322	4700	8200	1177
3925MUNDY	11	4654	2025	12550	3281
4ALAMO	12	1432	600	2730	758
4ADY	12	2259	1720	2825	461
4BOWIE	12	2010	1260	2610	424
4CORONADO	12	1947	710	5300	1205
4CRISTOREY	11	24283	4286	32400	7238
4ELPASOHIG	12	3344	1975	7700	1535
4HART	12	1473	600	2950	730
4HOLYFAMIL	12	3192	430	5200	1376
4JESUSEMAR	12	2958	1000	4810	1010
4KERNFIRES	1	2250	2250	2250	
4LAMAR	12	2276	1700	3530	572
4LINCOLN	12	2029	62	8650	2500
4MESITA	12	4365	2660	7455	1510
4MOREHEAD	12	782	25	4253	1170
4PUTNAM	12	328	60	730	196
4ROBERTS	12	270	27	955	256

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                 PARAMETER: ZINC

                      METHOD: ATOMIC ABSORPTION
                       UNITS: PARTS PER MILLION

                       YEAR: 1974

             NUMBER OF                                        STANDARD
   SITE       SAMPLES    AVERAGE     MINIMUM     MAXIMUM    DEVIATION

3121BRANDO         7        2354         585        6846        2920
31409MUNDY        12         967         400        2276         516
31730WPAIS         8        1426          60        5000        1564
31638WPAIS        11        2334         848        3252         715
31844WPAIS         9        1313         773        2626         546
32473VFW          12       24240       10175       42230       10394
32510STVRA        10        2877        1923        4762         891
32616PAISA        12       10920        4725       20216        6041
3301ROBINS         9        1806        1375        2425         305
3329VISTAH        10         492         186         806         218
33407ZAPAL         7         513         250         879         200
3703MCKELL        11        1739        1032        2753         501
37107THSTR        10        5974        3724        9256        1504
3825MUNDY         10        5009        2816        7925        1375
4ALAMO            12        1212         465        2300         512
4ADY              12        2515        1290        4225         893
4BOWIE            12        1580         118        2507         699
4BUENAVIST        12         900         290        1810         403
4CORONADO         12        1451         535        2517         625
4CRISTOREY        12       27322        9111       50000        9721
4ELPASOHIG        12        3060        1900        4430         708
4HART             11        1280         585        2850         609
4HOLYFAMIL        11        2124         297        4450        1250
4JESUS&MAR        11        4060        2140        9000        1959
4LAMAR            12        1795         660        4250         999
4LINCOLN          12        1260         443        2453         381
4MESITA           12        2920        1440        5512        1172
4MOREHEAD         12         369         147         880         208
4PUTNAM           12         571         313        1530         319
4ROBERTS          12         207          42         550         155
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PARAMETER: ZINC

METHOD: ATOMIC ABSORPTION
UNITS: PARTS PER MILLION

YEAR: 1975

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
3121BRANDT	1	1324	1324	1324	
31409MUNDY	3	1092	900	1300	201
31730WPAIS	2	270	115	425	219
31838WPAIS	2	1981	1720	2241	368
31844WPAIS	2	1096	289	1902	1141
32473VFW	3	18021	5148	36125	16724
32510STVFA	3	1209	130	1800	936
32616PAISA	3	9099	6440	11704	2632
3301ROBINS	2	1545	1540	1550	7
3329VISTAH	1	196	196	196	
3703MCKELL	3	1172	225	1940	371
37107THSTF	2	3622	775	6468	4026
3825MUNDY	1	410	410	410	
4ALAMO	3	967	260	1680	710
4ADY	3	1793	555	2850	1158
4BOWIE	3	1442	210	2288	1091
4BUENAVIST	3	885	580	1410	456
4CORONADO	3	1529	660	2733	1076
4CRISTOREY	3	27750	19000	41000	11670
4ELPASOHIG	3	3073	945	4525	1883
4HART	3	1999	45	5146	2752
4HOLYFAMIL	3	1392	255	2710	1238
4JESUS&MAR	3	6375	4925	8400	2195
4LAMAR	3	1783	165	3050	1476
4LINCOLN	3	627	350	966	313
4MESITA	3	3023	2350	3310	247
4MOREHEAD	3	522	410	690	148
4PUTNAM	3	1063	240	2400	1168
4ROBERTS	3	113	75	185	62

PARAMETER: ZINC

METHOD: ATOMIC ABSORPTION
UNITS: PARTS PER MILLION

YEAR: 1972

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
4ROOSEVELT	7	4510	3921	5333	507
4SACREDHEA	6	5450	4300	6600	331
4SANJACINT	6	2289	1630	3310	611
4STCLEMENT	5	8996	3040	20500	6765
4STIGNATIO	6	1800	1450	2640	426
4STMICHAEL	5	2920	2250	3900	655
4STPATRICK	6	2478	1500	3005	543
4UTEP	6	3881	2250	4900	1091
4VILAS	7	4339	2900	6240	1256
4WESTERNHI	7	3666	1830	17400	5619
4WHITE	6	73908	53000	102900	17513
4100MADELI	1	6060	6060	6060	
4110WILLIE	1	13200	13200	13200	
41100MADEL	6	8062	4250	13600	5356
4113PITOFE	5	25925	19300	33400	5246
4119ACARLO	4	61523	20500	181100	79725
4120WILLIE	5	41590	17200	77500	30593
4121BRANDO	7	2405	1600	3650	833
41409MUNDY	7	1805	322	4400	1472
4148CHURCH	7	935	500	1400	303
41730WPAIS	7	3989	1500	11544	3436
41838WPAIS	7	2561	1590	4057	820
41844WPAIS	7	10101	2350	27145	8741
4200CARLOS	1	9250	9250	9250	
4204WILLIE	4	22050	11500	31500	9940
4216ACARLO	4	24050	10200	61500	25026
42473VFW	7	29538	19200	39000	8270
42510STVRA	6	54030	7850	153000	52847
42616PAISA	7	14736	7500	32250	8744
4305SKANSA	1	1230	1230	1230	
43210PIEDM	5	5810	1450	19100	7546
4329VISTAH	7	552	430	650	80
43407ZAPAL	6	1650	772	4700	1504
4425MUNDY	2	4775	4650	4900	177
4510STVRAI	1	93300	93300	93300	
4701TURNEY	3	3160	800	7180	3499
4705SHILLS	7	1839	1230	2725	634
4710MCKELL	5	4760	3300	7000	1851
47107THSTR	7	7200	4650	9500	1760
4805SKANSA	4	1101	830	1375	226
4825MUNDY	4	5188	4100	7500	1561

PARAMETER: ZINC

METHOD: ATOMIC ABSORPTION
UNITS: PARTS PER MILLION

YEAR: 1973

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
4ROOSEVELT	12	3117	2027	4450	815
4SACREDHEA	12	3705	1950	4825	935
4SANJACINT	12	2969	2000	4650	854
4STCLEMENT	10	6736	3350	10269	2307
4STIGNATIO	12	1736	1050	2438	440
4STMICHAEL	12	2765	989	5120	977
4STPATRICK	12	4342	2750	11507	2314
4UTEP	12	4426	2920	6550	1082
4VILAS	11	3914	2475	5856	1144
4WESTERNHI	12	2168	330	6700	1605
4WHITE	12	25728	1000	102200	34622
41100MADEL	2	9207	8714	9700	697
41218RANDO	10	2622	266	4500	1237
41409MUNDY	12	1289	86	2450	647
4146CHURCH	12	1003	350	2100	572
41730WPAIS	12	2111	125	6828	1863
41834WPAIS	12	2095	106	3575	1145
41844WPAIS	12	1981	208	4200	982
42473VFW	12	28965	3936	48600	12595
42510STVFA	12	3585	1831	6500	1371
42616PAISA	12	11490	960	25500	5548
4301ROBINS	8	2411	1356	3533	762
43210PIEDM	7	1101	200	1660	454
4329VISTAH	12	853	256	1950	530
43407ZAPAL	11	604	117	1425	451
4706SHILLS	11	2036	1550	2800	394
4708MCKELL	9	2756	216	7200	1969
47107THSTR	12	6632	2193	9200	1864
4825MUNDY	11	3791	1216	9000	2235

PARAMETER: ZINC

METHOD: ATOMIC ABSORPTION
UNITS: PARTS PER MILLION

YEAR: 1974

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
4ROOSEVELT	11	2514	1520	3475	726
4SACREDHEA	12	4688	2725	7500	1749
4SANJACINT	11	2952	1060	6400	1453
4STCLEMENT	12	6000	3570	10562	2165
4STIGNATIO	7	1767	1040	3575	883
4STMICHAEL	6	1702	184	2392	791
4STPATRICK	12	3055	2110	4325	608
4UTEP	10	4776	2860	10750	2237
4VILAS	12	3455	2045	6353	1415
4WESTERNHI	11	4127	560	21223	6207
4WHITE	11	17681	6835	33466	8467
4121BRANDO	7	2229	980	6399	1903
41409MUNDY	12	1169	475	2673	596
41730WPAIS	8	1719	650	5190	1502
41838WPAIS	11	2591	1440	3575	663
41844WPAIS	9	1860	844	4250	1059
42473VFW	12	28002	10000	51176	13450
42510STVRA	12	3260	1516	5350	1035
42616PAISA	12	11943	2875	24727	7480
4301ROBINS	10	2031	207	3567	846
4329VISTAH	10	601	250	953	241
43407ZAPAL	7	554	345	1135	256
4708MCKELL	12	2188	817	4375	953
47107THSTR	10	6182	3884	8751	1355
4825MUNDY	10	5905	1994	10293	2677

PARAMETER: ZINC

METHOD: ATOMIC ABSORPTION
UNITS: PARTS PER MILLION

YEAR: 1975

SITE	NUMBER OF SAMPLES	AVERAGE	MINIMUM	MAXIMUM	STANDARD DEVIATION
4ROOSEVELT	2	2025	500	3550	21[illegible]7
4SAL[illegible]	[illegible]	41[illegible]	[illegible]	[illegible]350	[illegible]2[illegible]
4SANJAQUIN	3	89[illegible]4	170	22750	120[illegible]8
4STCLEMENT	3	9370	210	20650	103[illegible]4
4STPATRICK	3	3238	415	5050	2478
4UTEP	3	2790	20	5026	2545
4VILAS	3	3705	840	6400	2784
4WESTERNHI	3	1718	533	3225	1375
4WHITE	3	7402	2350	12750	5206
41218RANDT	1	1863	1863	1863	
41409MUNDY	3	1453	1010	2000	503
41730WPAIS	2	330	275	385	78
41838WPAIS	3	1664	360	2775	1219
41844WPAIS	3	1970	260	4250	2055
42473VFW	3	20000	5999	40000	17777
42510STVRA	3	1406	230	2044	1021
42616PAISA	3	11617	6600	14502	4361
4301RUBINS	3	2133	1740	2700	503
4329VISTAH	1	270	270	270	
4708MCKELL	3	1186	225	2262	1023
47107THSTR	2	4098	1195	7000	4105
4825MUNDY	1	540	540	540	